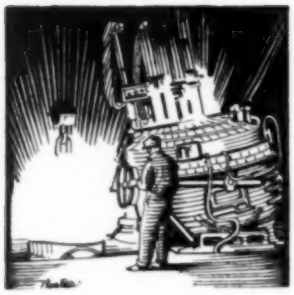


THE FOUNDRY for May

That Urge TO BUY

WHERE money exists, the urge to buy is speeding its circulation. Retail sales have been remarkably good during the first four months. Where credit is possible, on time or partial payment plans, commodities are moving. Witness the remarkable sales of automobiles, since the first of the year. Similarly, tractor sales have had a phenomenal push upward, as have other lines of farm equipment, incubators and units requiring much heavier investment. Part of the tractor demand comes directly or indirectly from government spending, while the remainder finds its source in better farm product prices, and in time payment plans available for tractors but not for draft horses.

The buying urge is a hunger long unsatisfied. Individually, people have desires intensified by five years of self denial. The first acquirement of means, either money or credit, brings immediate action. People buy.

Strangely similar is the condition among business and manufacturing firms. The buying urge is no less strong. New equipment, plant changes, replacement of worn out or obsolete machinery are the objects of this impelling hunger to acquire. The desire differs in kind and degree, but not intensity from that which prompts the purchase of a refrigerator for the home, a tractor, for the field or an automobile for the family convenience.

Unfortunately the opportunity to answer the buying urge in the latter instance has been delayed, restricted by the depletion of working capital, and the dearth of credit for the purchase of durable goods. This condition is stressed in a recent study by Col. Leonard P. Ayres, vice president of the Cleveland Trust Co., Cleveland. He points to the postponed buying of such goods as the great obstacle to the employment of thousands of men and states: "Business enterprises (the purchasers of five-sixths of all durable goods) buy in large amounts when actual profits or the prospects for them are good, but sharply curtail their buying when they think profit prospects are poor."

In the recent past, the automotive companies and a few other lines of manufacture have been alone in gratifying the buying urge through purchase of durable goods. The great pent-up demand for all classes of machinery and equipment from the railway, construction and heavy manufacturing machinery sources still is stagnant.

Meantime the pressure induced by a shortage of skilled men continues. Common labor for promised continual employment can be found; although a reluctance is encountered to accept any temporary work. Often, the inability to secure two or three trained men, may prevent the possible employment of many times the number of untrained workmen. Consequently, machinery must fill some of this lack. This is another factor in actively promoting the urge to buy equipment.

In the foundry industry, the consequent potential demand for castings is tremendous. Indirect though this demand may be, it is attendant upon the same buying urge. It awaits the restoration of confidence. It remains untouched by the satisfaction of the desire to buy and the buying of consumer goods.

Give them FACTS

A FOUNDRY foreman, three years unemployed and hitch-hiking to Chicago, said:

"If men understood better what the owners were up against, there'd be less trouble. Everybody is jumpy, lots of worries, plenty of stuff on the radio and in the papers to make 'em sore. Any little thing will make 'em want to quit or strike. Why don't some of these owners tell the real facts about their business, what they are up against in trying to keep a force together, tell 'em man to man, if it's a small shop. Or if it's a big place, and they have the right kind of foreman let them have the dope. Foremen hear plenty of windy arguments that a few facts and figures on prices and costs could settle".

Not bad advice this. Hope he found that job in Chicago.

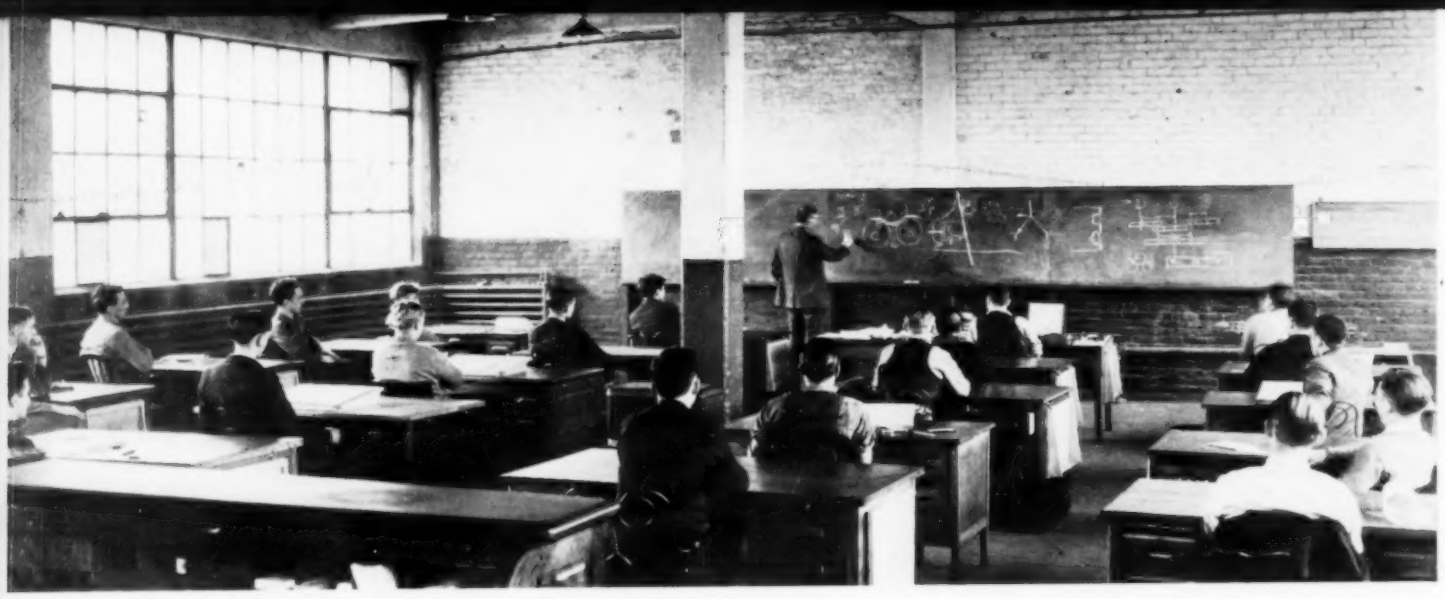


Fig. 1—The entire apprenticeship class meets with the instructor one morning a week

Extends Apprenticeship Training Plan

Farrel-Birmingham Co. builds for future by increasing supply of skilled workers

By FRANK G. STEINEBACH

WHENEVER foundrymen get together today, the topic of conversation sooner or later veers to a discussion of the constantly increasing shortage of skilled men. From one end of the country to the other, foundry managers realize clearly that it would be impossible in the immediate future to approach the normal operation of the late twenties with the present available supply of skilled molders, coremakers and patternmakers. Causes which have contributed to this alarming condition, not alone in foundries, but in all industries where skilled help is required, are fairly well known. Since 1930, many skilled men have reached the retirement age, or have passed on. Untold numbers, confronted with intermittent employment in industry, have found work in other lines where probably the same degree of skill is not required, entered some type of business for themselves, or removed to rural sections. In many cases, it will be exceedingly difficult to induce these men to give up their present connections where a certain income seems assured, and again return to their former occupations in industry where full time operations are not as yet universal.

While as a general rule the training of foundry apprentices practically has been abandoned during the years of the depression, a few far-seeing managements have been willing to gamble on continuing their training programs, even in the face of enormous difficulties. Some not

Fig. 2—Instruction is provided for patternmakers, molders and machinists

only have continued their apprenticeship programs all during that period, but in addition, have maintained liberal rates of pay, and have continued to give semiannual wage increases to apprentices, according to a previously adopted plan. The Farrel-Birmingham Co., Ansonia, Conn., manufacturer of chilled rolls and heavy machinery, is one of the outstanding examples of the latter group. Because that company has had the courage to continue and even augment its training program during the past few years, it now is in a position to benefit as an increased demand for its products steps up plant operation.

Company Trained It's Own Men

Thirteen years ago the Farrel-Birmingham Co. found itself in urgent need of a constant supply of young men trained in the fundamentals of molding, patternmaking, and machine shop operation. Since the greatest proportion of castings produced by that company may be classified as floor work, skilled molders are a prerequisite to the production of good castings. Careful study of the particular problems found at that plant resulted in the establishment of a training plan developed and recommended by the National Founders' association. Under that plan, boys were selected from the available supply in the town to enter upon a four year apprenticeship course, and at the same time similar instruction was made available to the molders' helpers in the plant, so that the latter group might develop into molders as rapidly as their abilities would permit. In fact, the company was so desirous of providing a larger supply of men skilled in molding practice, that every man in the shop was urged to carry a trowel. Experience in that type of course developed the interesting fact that while the majority of apprentices succeeded through instruction in becoming all-around molders, the helpers taking the course as a rule became specialists in one particular type of molding practice.

Fig. 3—The majority of apprentices succeed through the instruction in the class room and plant in becoming all-around molders

Fig. 4—It is the plan to arrange the plant training so each boy has the opportunity of working for short periods in other departments

This plan was carried on by the company for approximately 13 years, and many all-around molders were trained. During the past year, the management felt that greater opportunity should be offered by a course of certain educational studies, most of which bear more or less directly on foundry practice. About six months ago a new plan was adopted whereby an apprenticeship course is offered in foundry, machine shop and patternshop practice. This program is based on the course and text prepared by the International Correspondence school, Scranton, Pa. While the individual boys pay for the course itself the Farrel-Birmingham Co. provides the instructor, the room for meetings, and other facilities of administration. The company also pays the wages of the boys during the period they spend in the class room.

The apprentice instructor is available at the plant in Ansonia on Wednesday and Thursday of each week. During the remainder of the time he is employed in similar work with other plants in New England. On Wednesday, the instructor goes over the papers, takes care of records of students and is available for conference with any of the boys taking the course. The entire apprenticeship class meets with the instructor every Thursday morning from 9 to 12. During that period the instructor goes over the work as outlined in the course, advises the boys, answers any questions which may arise, and also gives occasional written and oral examinations as a check on the progress which the boys are making in the class. The class on Thursday morning is attended by the machine shop and patternshop apprentices as well as those study-

ing the various features of foundry practice.

The course, as administered by the International school and the instructor for the foundry apprentices, includes the following subjects: Shop economics; mathematics; reading of blue prints; mechanical drawing; English; and subjects relating to foundry practice such as molding, cupola practice, foundry equipment, casting, elementary metallurgy, and elementary chemistry. The regular written tests, provided with the course, are completed and sent to the International school for grading. Another feature of the course which has proven valuable in giving the boys a more rounded training, consists of periodic talks by company executives and departmental heads on the particular subjects with which the members of the managerial staff are most directly connected. It should be noted that during the three hour class on Thursday, not all of the boys may be doing the same type of work, although certain studies are common to all classes of apprentices. However, this class period provides a greater opportunity or study and at the same time makes it more convenient to ask and answer questions.

Under the present pay schedule, and along the lines inaugurated when the plan first went into effect, the foundry apprentices are started by the company at 40 cents an hour. Providing satisfactory progress is made, the boys are given a raise of 3 cents an hour after each period of six months, so that at the end of four years, the graduate apprentice receives 64 cents an hour. Upon completing the course, he automatically is given an additional raise of 5 cents an hour, thus increasing his wage to 69 cents an hour when he starts as a molder in the shop.

If, at the end of any six month period, the boy has not made sufficient progress in both his shop and class work to justify the increase in hourly wage, he is given a period of three months in which to straighten out the difficulties and find himself. If at the end of that period his progress has been satisfactory, he is given the wage increase and continued with the class. On the other hand, if it is felt by those in charge that it is impossible for him to complete the course successfully, the training must be discontinued. The decision as to whether or not satisfactory progress has been made during any period rests with the vice president of the company, and is based partly upon reports from the instructor and the International Correspondence school, but principally upon reports made by the superintendent and foreman, covering in detail the progress made by the boy in the foundry. Company executives are exceedingly interested in the apprenticeship work and follow closely the progress which the various boys are making.

The company also has endeavored to provide every possible opportunity for advancement for young men employed in the various departments. When the present apprentice school was started several months ago, the management selected a number of young men from the foundry pattern- (*Please turn to page* 58)

Fig. 5—Work in the plant is under the direct supervision of the superintendent and foremen, and is watched closely by all plant executives

Night view of the business section of Toronto. The Royal York, convention headquarters, is at the right

Canadians Make Convention Plans

Committees appointed to arrange special features for A. F. A. meeting at Toronto

FOUNDRYMEN of Canada are being organized into committees to prepare a welcome for visitors to the 1935 annual convention of the American Foundrymen's association, which will be held in Toronto, Aug. 20 to 23. A great amount of interest already has developed in the coming meeting, which is the first held in Canada since 1908, and an exceptional attendance is anticipated from both Canada and the United States. Headquarters for the convention will be at the Royal York hotel, where splendid facilities are available for every feature of the convention.

Major L. L. Anthes, Anthes Foundry Ltd., Toronto, past president of the American Foundrymen's association, has been made general chairman of the Canadian committee. While the committee personnel as yet has not been completed, the following chairmen and vice chairmen have been appointed:

General Committee: Chairman, L. L. Anthes, Anthes Foundry Ltd., vice chairmen, G. C. Crawford, American Radiator & Standard Sanitary Mfg. Co., Toronto, and A. G. Storie, Fittings, Ltd., Oshawa, and a past director of A.F.A.

Publicity Committee: Chairman C. E. Macdonald, International Nickel Co. Ltd., Toronto, vice chairmen, H. V. Buttefield, *Canadian Machinery & Mfg. News*, Toronto, and Francis H. Bell, *Canada's Foundry Journal*, Toronto.

Transportation Committee: Chairman, Col. J. Inglis, Toronto Hardware Mfg. Co. Ltd., Toronto; vice chairmen, Lieut. Col. Mess, Whiting Corp., Toronto, and William Coulter, Coulter Brass & Copper Ltd., Toronto.

Hotel and Entertainment Committee: Chairman, D. B. McCoy, Steel Co. of Canada Ltd., Hamilton; vice chairmen, R. G. Yates, Canadian Furnace Co., Ltd., Port Colborne, and Rex Nicholson, Algoma Steel Corp., Ltd., Toronto.

Golf Committee: Chairman, E. Holt Gurney, Gurney Foundry Co. Ltd., Toronto; vice chairmen, E. C. Burton, Link-Belt Co. Ltd., Toronto, and Clifford Sherman, Grinnell Co. Ltd., Toronto.

Plant Visitation Committee: Chairman Melville T. White, Canadian General Electric Co., Ltd., Toronto; vice (*Please turn to page* 72)

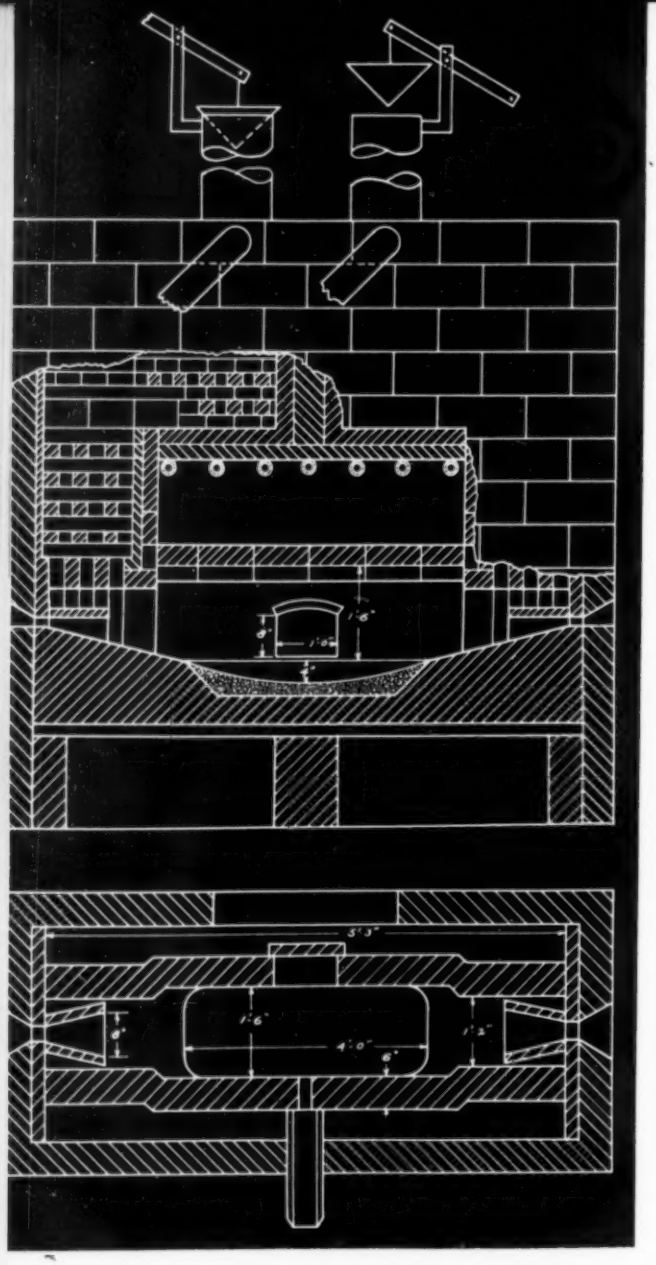


Fig. 1 (Above)—Cut away view of the furnace showing construction of checkers. Fig. 2 (Below)—Top view showing size of bath

Small Acid Open Hearth Furnace Has Capacity Of One Half Ton

By J. TRANTIN JR.

A SMALL acid open-hearth installation recently has been developed as the outgrowth of a succession of attempts to provide a melting unit for making small heats to further research on alloy steels and irons. From a crude makeshift apparatus, to which a number of progressive improvements have been applied, a furnace of commercial proportions has resulted. The original design utilized one center-fired flame; coal gas being ignited and conveyed through a curved chamber which entered the furnace at the center of the roof. Dispersion and distribution of the flame was controlled by adjusting ports at the ends. This installation was exceedingly satisfactory for iron, but did not produce a high temperature sufficiently uniform to melt steel, due to the lack of proper flame control. After exhaustive experimentation and application of numerous ramifications of designs within the realm of possibility, the arrangement shown in Figs. 1, 2 and 3 finally was adopted.

It will be noted that the construction of this open-hearth furnace is somewhat of a departure from that of the standard open-hearth installations of larger capacities. The greatest difference in design is in the arrangement of the checker work, both as to the position or location of checkers, and the direction of flow of exhaust gases. It is believed that this method of checker construction brings the point of maximum superheating closer to the ports and by shortening the distance of travel of the gases from the furnace to the checkers the heat losses due to conduction are reduced to a minimum. After leaving the end ports the products of combustion filter through the sides and top into the first row of checkers and after several directional reverses are exhausted through the furnace stack.

Explains Checker Construction

The first two rows of checkers consist of 3 x 6 x 9-inch fire brick arranged so as to allow openings measuring 3 x 3 inches. The succeeding rows are constructed of 3 x 3 x 6-inch bricks and also are provided with the same size openings.

A positive pressure blower supplies air to the checkers at 12 ounce pressure. The air enters at the top of the checkers through pipes with constricted openings. A damper is provided in each of the blast pipes and likewise each stack is fitted with a damper at the top. The dampers in the blast pipes are operated individually so as to permit flexibility and control of the flame entering the furnace. Through the regulation of these dampers it (*Please turn to page* 60)

MALLEABLE CAST IRON

Its Properties and Many Applications

By DUNCAN P. FORBES
Gunite Foundries Corp., Rockford, Ill.

MALLEABLE iron must be regarded as a working material; in other words, it is more usually a component of machines than it is of static structures. It has to have strength to withstand strains, and toughness to withstand abuse.

The usual commercial analysis has a carbon content slightly under 2.50 per cent and a silicon content slightly under 1.00 per cent, with other impurities such as manganese, sulphur and phosphorus, within certain definite limitations. This material is poured into sand molds and solidifies as white cast iron castings. White iron is hard and brittle and finds some commercial application in wearing parts, such as sandblast nozzles, cleaning stars and ball mill balls. White iron castings, which are to be malleablized, are heat treated or annealed in large ovens, usually being packed in containers with a sand or slag packing material, whose principal purpose is to prevent warping of the castings. In the old days, an oxidizing packing was used, which was intended to reduce the carbon content of the castings. This practice has been abandoned almost completely.

The heat treatment consists of holding the castings at a temperature of 1600 degrees Fahr. or more for a sufficiently long period to break down the iron carbide into two constituents; temper carbon nodules and a solid solution of iron carbide in iron. The castings are then cooled in such a way that the carbide is precipitated out of the solid solution as additional temper carbon, leaving an ultimate structure of soft iron and uniformly distributed nodules of temper carbon.

As the metallurgy of this reaction has become more widely known, malleable foundries have taken advantage of the most desirable heat treating temperatures and as a result have succeeded in shortening materially the time required for annealing, which averaged, roughly, 7 days. A considerable tonnage of malleable iron now is made with a total time in the oven of 3 days, and this malleable iron is of the highest quality. The shortened anneal is possible only if extremely accurate temperature control can be maintained, and this is extremely difficult in large ovens, or with antiquated equipment.

The metal itself when it reaches the purchaser will have a tensile strength ranging from 50,000 pounds per square inch for high carbon iron to 60,000 pounds per square inch for low carbon iron, the increased strength apparently being due to the smaller percentage of temper carbon nodules which contribute nothing to the tensile properties. It is surprising that malleable iron test bars with a rough sand cast surface on the outside will show unusual uniformity. The maximum variation from a 55,000 pound per square inch tensile strength average is rarely more than plus or minus 3000 or 4000 pounds per square inch. This means that malleable iron is uniform and dependable.

Malleable iron is unusual in that the yield point is a high percentage of the ultimate strength. For example, a malleable with 55,000 pounds per square inch ultimate strength will have a yield point of about 37,000 pounds per square inch or 67 per cent, a high yield point, a good ductility.

Castings Tough and Ductile

Most malleable produced today is tough and ductile. The elongation of a $\frac{5}{8}$-inch diameter test bar in a 2-inch gage length is above 15 per cent. Producers of low carbon malleable have no difficulty in averaging as high as 25 per cent. It can be seen from this that malleable with a high yield point and a good ductility is at least comparable from a strength standpoint with low carbon cast steel and soft forgings.

Malleable iron has a number of fields of usefulness, where it is entrenched firmly. In the long run, a product will be purchased only if it fills the necessary requirements at the lowest cost. It is useless for an industry to try to sell a product for an application where some other material is more economical.

This can be illustrated by the use of malleable iron in the automotive industry. As an example, take the front hub of a passenger car. This is almost universally produced of malleable iron although it could be produced by several other methods. What property of malleable iron makes it particularly suited for such an application? In the first place, the yield point of malleable is sufficiently close to that of forgings, steel castings, and stampings, so that from a static strength (*Please turn to page* 63)

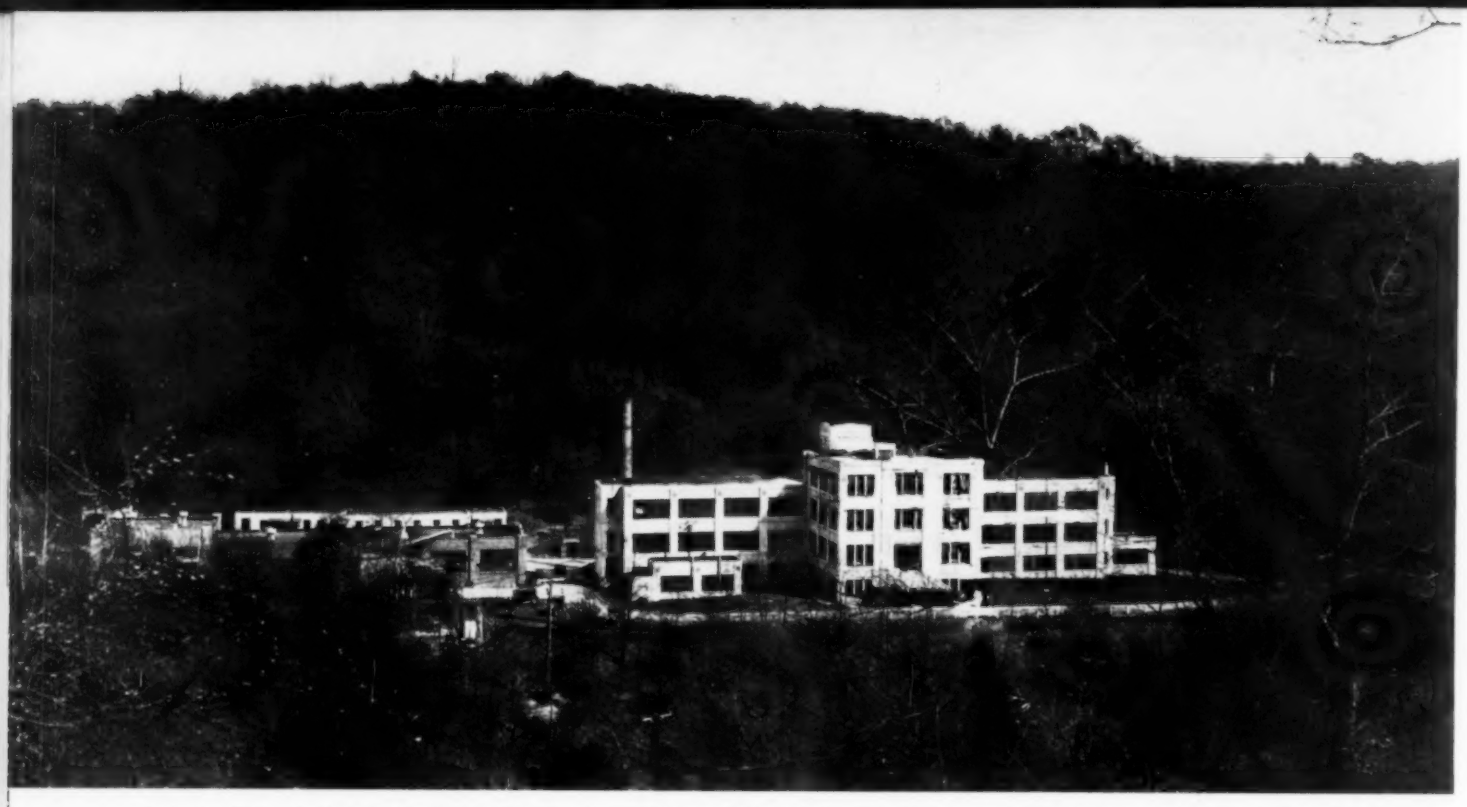


Fig. 1—The plant for the manufacture of munitions during the war years was erected in a secluded position among the forest covered hills of western Pennsylvania

MELT METALS WITH NATURAL GAS

By PAT DWYER

IN 1892 the Homestead Valve Co., erected a plant in Homestead, Pa., for the manufacture of valves. Expansion of the business made it necessary to secure larger space to carry on manufacturing operations. In a period of 30 years four different plants were occupied and each in turn was outgrown. In 1928 the company had a choice of three alternatives: Erection of an entirely new plant on the existing property; erection of a new plant elsewhere; or acquisition of a suitable plant already in existence, but either idle or available for any one of several reasons.

Choice finally settled on a modern manufacturing plant on the outskirts of Coraopolis, Pa., on the Ohio river about 15 miles from Pittsburgh. This plant had been built during the war years for the manufacture of munitions. Later it was operated for some time on other products, but had been on the market for a considerable period when it was acquired by the Homestead Valve Co. Due to its original purpose the plant was erected in an isolated locality on a hillside densely covered by trees. In this natural setting the classic lines of the white buildings present a singularly beautiful appearance at all seasons of the year, particularly in the spring and summer when the trees are in full foliage, and perhaps even to a greater extent in the fall when the blue mist rises above the hills covered in kaleidoscopic variety with splashes of color in every shade of yellow and red.

After 7 years occupancy the company claims that the move into this plant constitutes one of the most important events in its history. The sur-

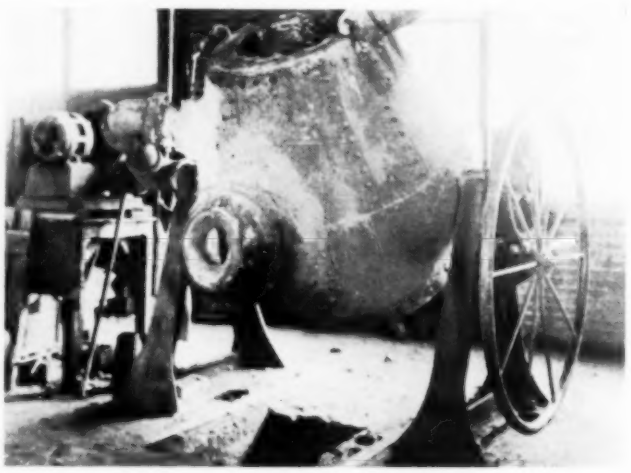


Fig. 2—Iron is melted in a gas fired tilting furnace

roundings are reflected in the morale, the esprit de corps of the employes. This point apparently is confirmed by a labor turnover less than half of one per cent. Incidentally also, it is interesting to note that manufacturing operations were not interrupted to any material extent during the transition period.

Electric power is secured from outside, but otherwise the plant is self-contained. Water for drinking purpose is piped by gravity from a spring on the hillside, while water for all other purposes is pumped from a creek at the bottom of the hill to a tank above the buildings. The water for industry and sanitation is chemically treated after it has served its purpose and in a pure state is discharged into the creek.

Room for future expansion is amply provided for in the present property embracing a total of 108 acres. The three story main building houses the general office, engineering department, machine shop, assembly department, testing room, shipping department, stock room and power plant. The foundry operations are carried on in an independent building while the pattern shop and pattern storage occupy a third building. The plant is devoted to the manufacture of valves in almost infinite variety and in a wide range of ferrous and nonferrous metals, also chemical spray cleaning machines. Steel castings are secured from an outside source, but gray iron, brass, bronze, nickel, monel metal, aluminum in various compositions are melted and cast in the foundry.

The foundry building of brick and steel construction is amply lighted through large windows extending throughout the entire length of the side and end walls. Additional light is provided by windows on both sides of the monitor type roof. The smooth cement floor facilitates the effort of the management in maintaining the clean and tidy appearance which characterizes every department of the plant.

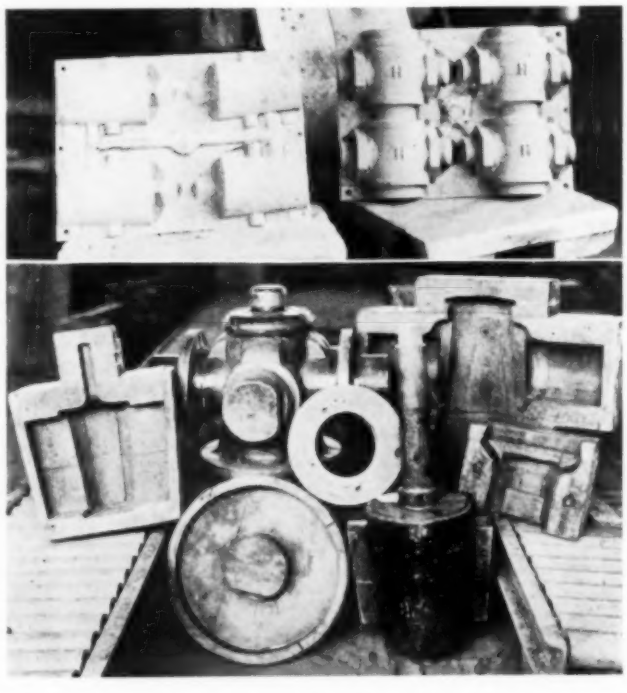


Fig. 3 (Above)—Typical pattern and gate layout for valve bodies and plugs. Fig. 4 (Below)—Patterns and coreboxes for individual valve and plug

Fig. 5—Pattern and half mold for small pump body

In line with what now is regarded as standard factory production methods, material flows constantly in one direction. Metals and raw materials enter the foundry at one end and the finished castings pass through the opposite end on the way to the machine shop. The castings are cleaned in a sandblast barrel made by the Pangborn Corp., Hagerstown, Md., and in a sandblast cabinet supplied by the American Foundry Equipment Co., Mishawaka, Ind. Gate stumps and fins are ground on double stand grinders supplied by the Norton Co., Worcester, Mass., and the U. S. Electrical Tool Co., Cincinnati. A dust collecting system removes the dust from the sandblast and grinding units.

Melting equipment includes one tilting type open flame furnace for melting iron, one tilting type crucible furnace and one stationary type crucible furnace for melting the nonferrous metals. Gas is used as fuel in all three furnaces, and while this is not unusual in nonferrous melting practice, it differs widely from usual gray iron foundry practice, where the metal is melted in the cupola, air furnace, electric furnace, rotary furnace and occasionally in the open hearth furnace.

Experiments with charges of various weights from 1000 to 2000 pounds in the furnace shown in Fig. 2, indicated that the best results are secured from 1400-pound charges. Capacity of the furnace is from 3 to 4 heats per day. Iron in the castings is dense, homogeneous, readily machinable and shows a consistently high tensile strength between 33,000 and 40,000 pounds per square inch depending on the composition. The charge is made up of 30 per cent pig iron and 70 per cent scrap. The scrap is mostly motor blocks containing an appreciable amount of steel and the pig iron is taken from two piles, one hard, one soft. Analysis of the soft iron shows: Silicon 2.25 per cent, sulphur 0.02 per cent, phosphorus 0.18 per cent, manganese 1.04 per cent. The hard iron pig contains silicon 1.88 per cent, sulphur 0.02 per cent, phosphorus 0.14 per cent, manganese 0.96 per cent. Relative amounts of the pig and scrap are varied to meet the requirements

Fig. 6—The molds are run out from the molding machines on roller conveyors

of different classes of castings. Typical analysis of iron for the ordinary run of valves showing a tensile strength of 33,000 pounds per square inch is: Silicon 1.36-1.55 per cent, manganese 0.48-0.60 per cent, total carbon 3.05 per cent.

Up to the present the body of the furnace shown in Fig. 2, has been swung into any desired position by the large hand wheel at the side. Motion is transmitted to the furnace through a worm and worm gear. Eventually it is proposed to attach a small motor to this device for the purpose of imparting a slow rocking motion to the furnace during the melting period. In this manner full advantage will be taken of the heated lining exposed alternately to the flame and the metal.

The standard type stationary crucible furnace shown in Fig. 7 designed for melting brass and bronze of various compositions was converted into a high temperature unit capable of melting monel metal and other high nickel content mixtures, by the addition of a combustion chamber outside the furnace where a piece of steel pipe, is lined with a refractory compound and is detachable for periodic renewal of the lining. The flame passes through a constricted neck and enters the furnace chamber at a tangent, thus insuring a constant and whirling flame around the pot which holds approximately 150 pounds of metal.

A temperature of approximately 3000 degrees Fahr. is attained, but the consumption of gas and the elapsed time of a heat vary to some extent depending on whether the start is made in a cold furnace, or in one from which a heat already has been taken. A typical log of two consecutive heats shows that the first heat was started at 10:34 a.m. and the pot was lifted at 12:20 a.m. with a consumption of 1372 cubic feet of gas. The pot was replaced in the hot furnace at 12:33 p.m. and lifted again at 1:51 p.m. For the second pot the gas consumption was 1077 cubic feet, a reduction of 300 feet.

A nickel bronze used extensively in castings connected with tanks and other utensils employed in the storage, processing and transportation of milk and other food stuffs, contains nickel 31 per cent, zinc 10 per cent, tin 2 per cent, lead 3 per cent and copper 54 per cent. For marine use where the castings are exposed to salt water the nickel bronze castings are poured from a mixture containing copper 46 per cent, tin 4 per cent, lead 6 per cent, zinc 6 per cent, and the remainder, 38 per cent, a 50-50 mixture of copper and nickel. The tilting crucible type furnace shown in Fig. 8, with a capacity of 450 pounds is employed for melting various nickel free nonferrous alloys in which an extremely high temperature is not required. Special mixtures are made up when required, but the bulk of the castings fall under three classifications: 1—Red brass, also known as ounce metal, steam metal and eighty-five-three-fives; 2—Gun metal, also known as government bronze, admiralty gun metal and eighty-eight-ten-two; 3—Acid resisting metal.

The first, as one of the names implies, is made up of copper 85 per (*Please turn to page* 64)

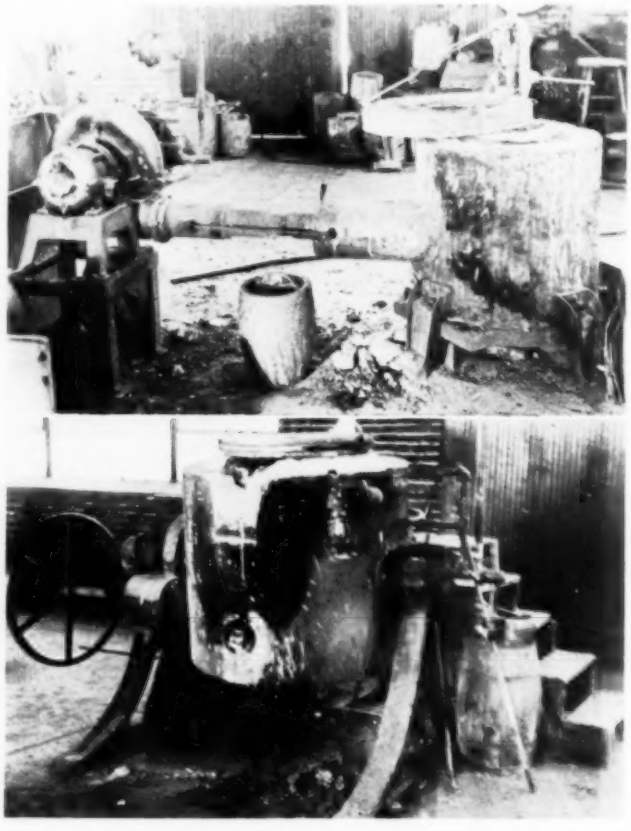


Fig. 7—(Above)—High temperature is attained through a combustion chamber at the side of the furnace. Fig. 8 (Below)—Ordinary brasses and bronzes are melted in a tilting type crucible furnace

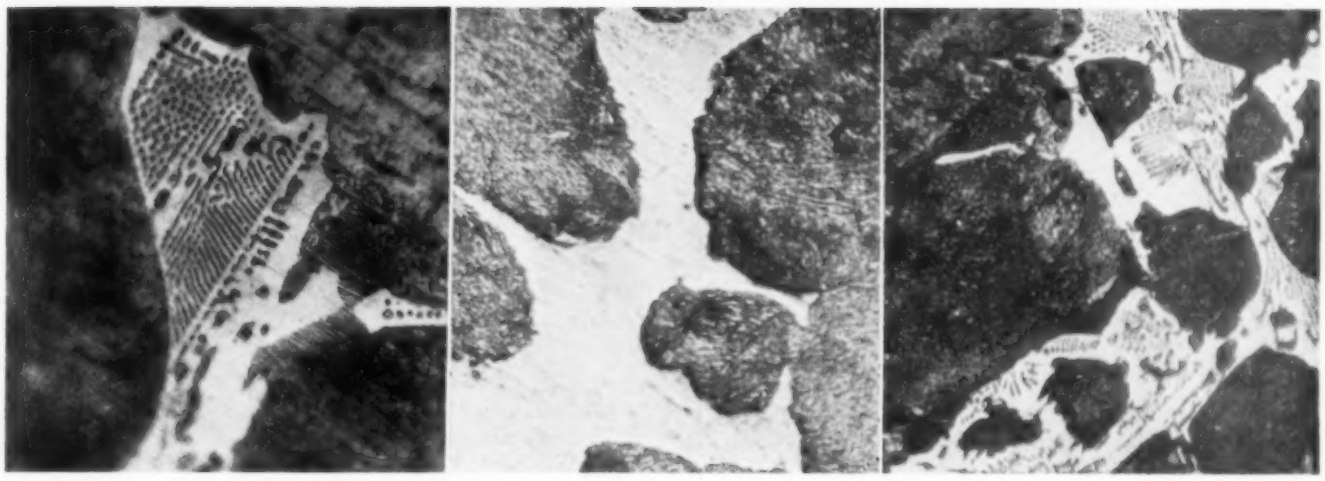


Fig. 25 (Left)—Steadite-honeycomb or cellular structure, x735, etched with bromine. Fig. 26 (Center)—Steadite in low phosphorus iron, x600, etched with picric acid. Fig. 27 (Right)—Steadite in 1.15 per cent phosphorus iron, x600, etched

GRAY CAST IRON

By JOHN W. BOLTON

Chapter I (*Concluded*)

PEARLITE is formed through the conversion of austenite of eutectoid composition. This transformation in commercial irons occurs at about 1325 to 1350 degrees Fahr. and is accompanied by an evolution of heat and the appearance of magnetism.

Austenite is the solid solution of carbon in gamma iron. The iron atoms have the face centered cubic arrangement and the carbon is dispersed atomically. Obviously gamma iron containing 0.85 per cent carbon (in pure iron carbon alloys) in solid solution has the eutectoid percentage of carbon. In gray irons of effectively eutectoid matrix composition, austenite is transferred wholly into pearlite when cooled to below 1325 to 1350 degrees Fahr. In pure iron the change from gamma to alpha occurs at 1650 degrees Fahr. Presence of carbon in solid solution plus the effects of silicon and other elements, as in gray iron, lowers the transformation point some 310 degrees Fahr. That change is illustrated diagramatically in Fig. 37.

Pearlite then is the eutectoid of cementite and alpha iron or ferrite with this definition subject to the qualifications mentioned in preceding paragraphs.

On a rapid cycle of heating and cooling pearlite is stable up to about 1325 to 1350 degrees Fahr. However, if a pearlitic iron is heated for long periods of time at about 900 degrees Fahr. or above, some or all of the cementite breaks down to graphite and ferrite. Therefore the ultimate decomposition products of pearlite when heated for long periods in the range from about 900

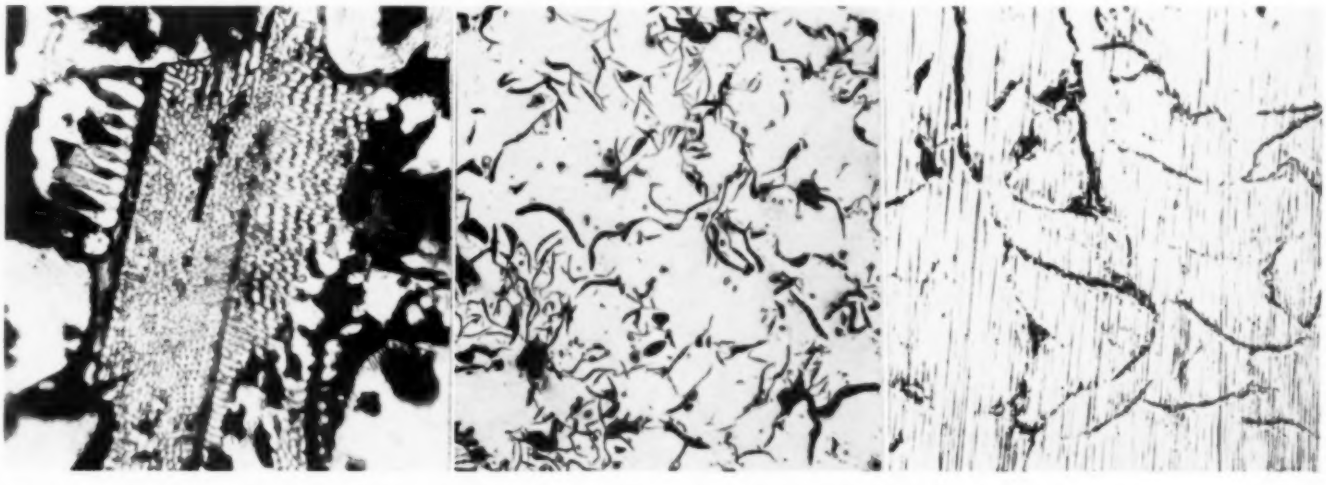


Fig. 28 (Left)—Steadite, x2000, etched with sodium picrate. Fig. 29 (Center)—Graphite in gray iron, x100, unetched. Fig 30 (Right)—Dragging or peening over of graphite flakes, x100, unetched

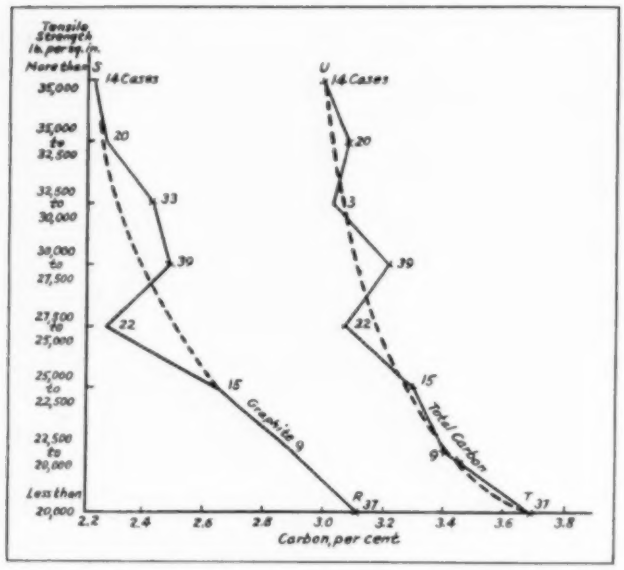


Fig. 31—Influence of graphite on strength of cast iron, according to Howe

degrees up to about 1325 to 1350 degrees Fahr. are ferrite and graphite.

The third structural component in the matrix of gray iron is known as steadite. This name was chosen in honor of the late Dr. J. E. Stead, whose classic researches on the effects of phosphorus in iron first firmly established the general nature of that component.

Practically all phosphorus in gray irons is contained in the component steadite. That structure is hard, and appears white on etching with picric acid. It usually exhibits a cellular or honeycomb structure as shown in Fig. 25. The exact nature of the steadite found in commercial irons is disputed. It is often referred to as the phosphide eutectic. As will be shown later, that term cannot be considered wholly accurate. For the present it will be sufficient to identify steadite as "the phosphorus rich component found in gray irons."

Steadite appears in gray irons containing even small percentages of phosphorus. The sample shown, Fig. 26, contains 0.12 per cent phosphorus, Fig. 27 contains 1.15 per cent and Fig. 25, 0.70 per cent.

While steadite is not the true binary eutectic of iron and iron phosphide, it appears that in most irons steadite resembles that eutectic substance rather closely.

The binary iron-iron phosphide eutectic contains 10.2 per cent phosphorus and 89.8 per cent iron, or approximately 10 parts phosphorus and 90 parts iron. Phosphorus is combined with iron to form iron phosphide, Fe_3P. Iron phosphide is composed of 1 part phosphorus to 5.43 parts iron by weight. Therefore 1 part of phosphorus will form 6.43 parts of iron phosphide, which will form 10.0 parts eutectic.

Iron-iron phosphide eutectic is hard, 5.5 on the Mohs minerological scratch hardness scale. Quartz sand is 6.0 on this scale. The iron-iron phosphide eutectic has a specific gravity of 7.32. It is quite brittle and melts at about 1800 degrees Fahr. Since steadite is composed largely of that eutectic it is formed at a low temperature, and is the most fluid component in the iron. Steadite in gray iron separates out at about 1800 degrees Fahr. as may be shown by the cooling curves.

Since steadite is the last component to solidify it is found in the grain boundary positions. When there is sufficient phosphorus present and cooling conditions are favorable the steadite therefore frequently forms grain boundary patterns or envelopes.

When etched with alkaline sodium picrate, steadite is blackened, as shown in Fig. 28, although not as rapidly as cementite.

As has been explained, gray iron is composed of a metallic matrix within which many graphite flakes are dispersed. It has been known for many years that the graphitic carbon in gray iron influences the mechanical properties. This was illustrated diagrammatically by Howe—*Metallography of Steel and Cast Iron*—and is shown in Fig. 31. It also was mentioned by Sauveur and others. However, the importance

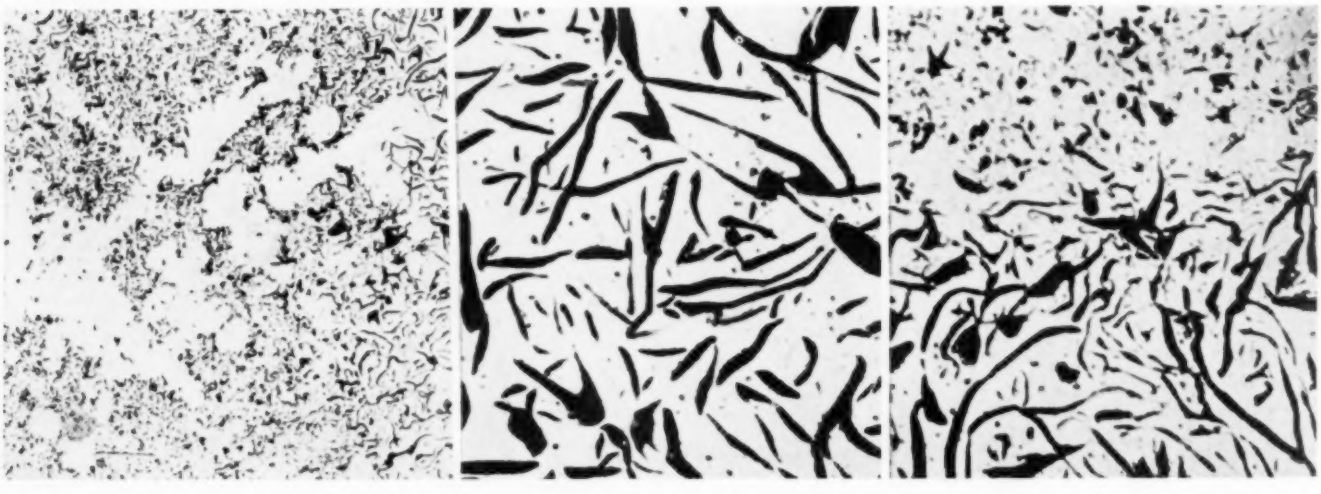


Fig. 32 (Left)—Fine graphite, x100, unetched. Fig. 33 (Center)—Coarse graphite, x100, unetched. Fig. 34 (Right)—Fine and coarse graphite, shown in same sample, x100, unetched

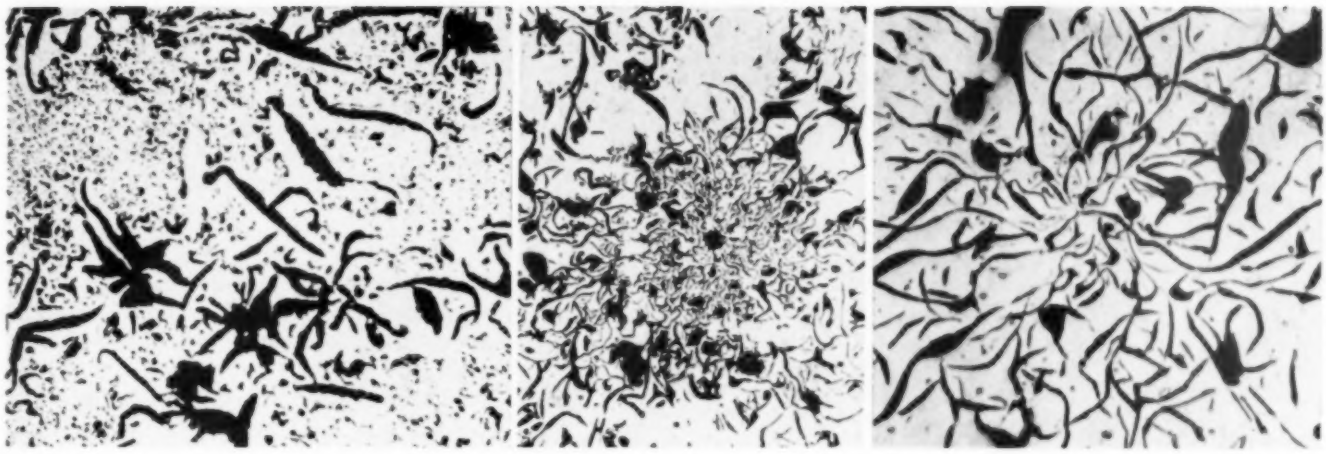


Fig. 35 (Left)—Graphite formations in hyper-eutectic iron, x75, unetched. Fig. 36A (Center)—Rosette or whorl formation in early stage of development. Fig. 36B (Right)—same as A, only in later stage of development, x100 unetched

of the graphitic structure was rather underemphasized until recently. The average foundryman formerly paid a great deal of attention to silicon content and little or none to the total carbon and graphite content. Metallurgists often overemphasized the importance of combined carbon content. They knew that the tensile strength of steel increases with increasing amounts of combined carbon and reasoned that the same would be true in cast iron.

Graphite in Gray Iron

It is only within the last 10 years or so that several investigators began publication of a series of researches which indicate that the amount of graphite, its size and distribution, are the more fundamental determinants of the strength and rigidity of gray irons. At first that viewpoint aroused skepticism, but today its correctness generally is conceded. This point will be referred to further in a discussion of relationship of structure to mechanical properties. Meanwhile we will consider the nature and appearance of the graphite in commercial gray irons.

If a piece of gray iron is polished and examined under the microscope the graphite is apparent as black flakes scattered throughout the metal as shown in Fig. 29. If a piece of gray iron is dissolved in suitable acids these flakes remain undissolved, remaining as black residue. If that residue is dried and examined it will be found to be soft and nontenaceous, composed of many flakes and flake fragments. These have the shiny black appearance and leave the same black coloring on the fingers as does ordinary commercial graphite. Chemical analysis shows that the residue is indeed graphitic carbon. Examination by X-ray diffraction methods indicates that the graphite is the same in crystal structure as other graphites. The basic crystal structure possesses hexagonal symmetry—Bernal—*Proceedings Royal Society*, London, 1924, page 749. A crystal model is shown in Fig. 38.

The specific gravity of graphite is low, about 2.25 (International Critical Tables). That figure is for ordinary graphite. It is quite conceivable that graphite in gray irons varies somewhat in specific gravity, because of the pressure of solidifying metal during graphite formation. The specific gravity of ordinary gray iron is about 7.00 to 7.20. This means that the graphite is much lighter than the balance of the metal and occupies more volume for a given weight. Analysis reports percentage of graphite by weight. This graphite occupies more volume than analysis percentage by weight would suggest. According to the density previously given, 3 per cent of graphite by weight indicates about 9.6 per cent graphite by volume. Since the flakes occupy so large a volume and are nontenaceous, their marked effect in lowering strength and ductility is not surprising.

While not generally recognized it nevertheless

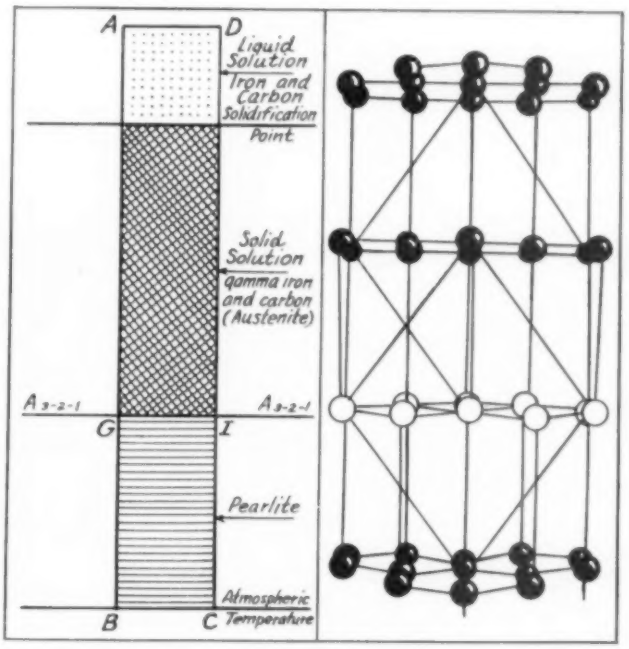


Fig. 37 (Left)—Lowering of transformation point, according to Sauveur. Fig. 38 (Right)—Model of graphite crystal, according to Clark

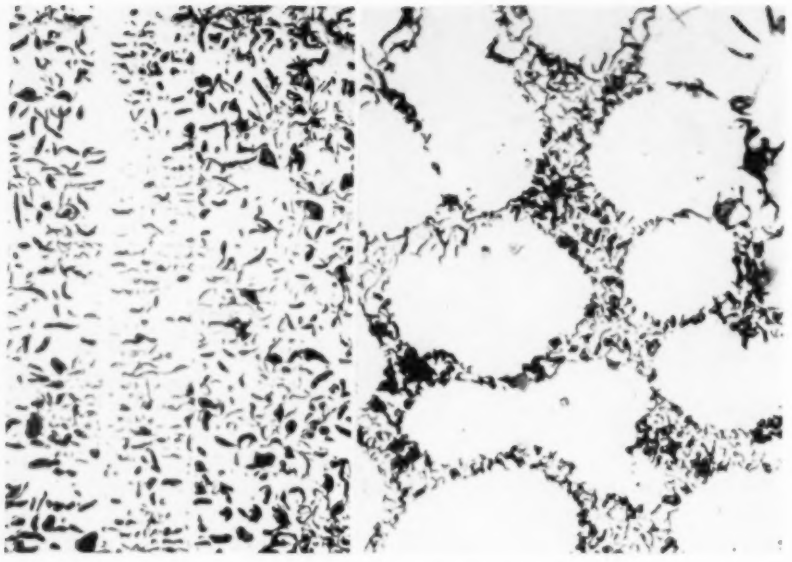


Fig. 39—Dendritic striation. A (left) x100, unetched. B (right) x500, unetched

is a fact that the appearance of graphite flakes in a micrograph may be quite deceptive. Technique of the most exacting sort is necessary to polish and photograph a sample without inadvertent distortion of the structure. Flakes may appear narrow, due to dragging action or peening over during the polishing operation, as shown in Fig. 30. That sample was ground so that the flakes were almost completely peened over. In some cases the dragging action actually obliterated many of the finer flake structures. When such samples are etched slightly and repolished very lightly, many of these hidden flakes show up and the sample may present quite a different appearance. Conversely, flakes, or the indentations occupied by flakes, may be widened and in some cases groups of flakes torn out, giving a rough coarse grained appearance, not at all indicative of the true structure.

Some gray irons are quite heterogeneous, structurally speaking. A rather extreme case of heterogeneity is shown in Figs. 32, 33, and 34. A micrcgraph 3 inches square at 100 diameters represents a section of specimen only 0.03-inch square. Such a small area may not be representative of the whole sample.

Attempts have been made to devise methods for determining the size and amount of graphite flakes from micrographs—Norbury and L. W. Bolton, British Cast Iron Research association report No. 56. The terms *fine* and *medium* and *coarse* graphite, as commonly used, are not sufficiently explicit. It would be desirable to determine the average length of flakes in a representative area but this is rather difficult. Often it is impractical to measure the actual flake lengths with accuracy. A micrograph shows two dimensions only while the graphite flakes exist in three dimensional formations. Some flakes are in the plane of the specimen as photographed. However, others intersect this plane at many random angles. It is hypothetically possible to allow for this by mathematical methods, but the practical results do not seem worth the effort. It is not the length of the flakes that count, from a mechanical viewpoint, but the amount of matrix between flakes and flake groupings. Cases are readily conceivable where larger flakes in certain distributions are less effective in lessening matrix coherence than individually finer flakes in less favorable distribution. Cases of this have been noted frequently in commercial practice.

Norbury and Bolton determined flake lengths, as they term them, on some six specimens in which the graphite structures ranged from extremely fine to very coarse. Their results are shown in the following table:

(*Please turn to page* 66)

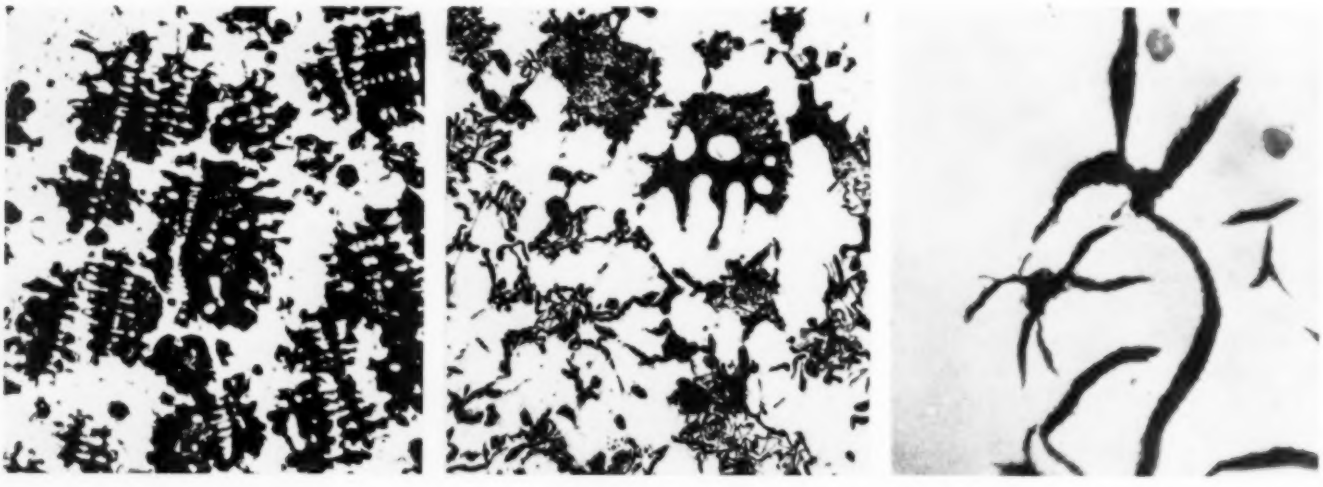


Fig. 40—Groups of pseudo-eutectic flakes, groups of dendritic outline. A (Left) x125 unetched. B (center) x75, unetched.
Fig. 41 (Right)—Star formation, x1000 unetched

Prevent Porosity in Fly Wheel Hubs

Sheet steel casing around sand core imparts slight chill to inside of hub

By J. H. EASTHAM

FOUNDRYMEN familiar with the production of fly wheel castings, realize the difficulty of preventing porosity in the hubs, a form of defect which usually does not appear until after the hub has been bored. Porosity is induced by faulty design in the casting and by careless and inefficient rod feeding after the casting is poured.

In many otherwise well managed shops, the important job of feeding a casting is entrusted to a man who does not understand the first principles of the operation. His only interest is to have the neck of the riser choke as quickly as possible and in that manner relieve him of a distinctly unpleasant job. In other instances sufficient room is not available among the pop gates for a riser of ample dimensions. Even with the most careful manipulation and constant cleaning of the feeding rod, the metal in a narrow neck congeals long before the feeding head.

In one plant where these conditions had prevailed for some time the superintendent decided that the application of a slight chill to the bore of the wheel might solve the problem. A piece of mild steel plate was fashioned to the required shape and size and substituted for the regular dry sand core. After it was set in place the interior was packed with heap sand. A vent hole in the center was formed with a gate pin. Edges of the plate were left $\frac{1}{2}$-inch apart to provide for contraction of the casting.

In the preliminary trials the flat top touch method was employed. Later in bores of smaller diameter and greater length the core entered a top print. Detail of this tapered addition—somewhat exaggerated—is shown in Fig. 2, plan and sectional views of a 6-foot diameter wheel weighing approximately 7000 pounds.

The thin sheet metal, $\frac{1}{8}$-inch in the smaller and 3/16-inch in the larger sizes, fused to the metal in the hub but did not increase the hardness of the iron. No difficulty was experienced in the boring operation. The steel casing was thoroughly cleaned and rubbed with an oily rag to prevent any blowing when the molten metal came into contact with it. Adequate risers were placed on the hubs and these were fed properly with rods in the hands of men who worked in 10-minute relays on the castings.

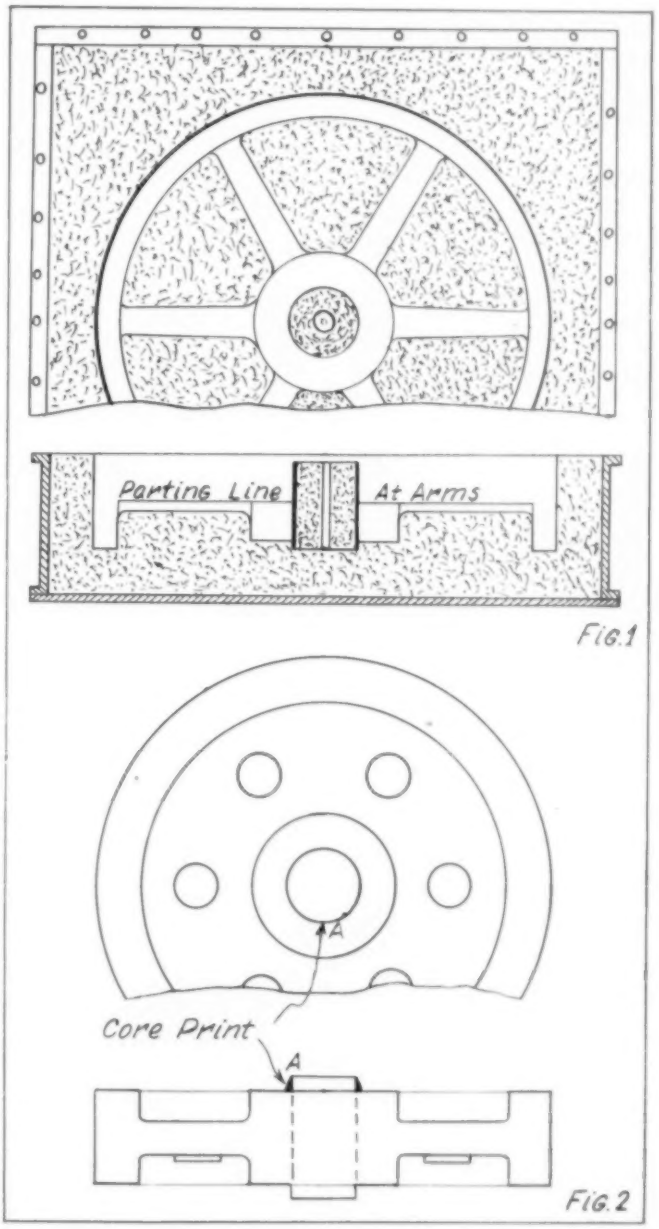


Fig. 1—Plan and sectional views of wheel with sheet metal hub core in place. Fig. 2—Showing disk fly wheel pattern with elongated top print AA

Fig. 1—Ordinary steel foundry practice and green sand facing are used in the production of iron gooseneck castings

Make Iron Castings in Steel Shop

Alloy irons cast in molds having the same green sand facing used for steel

By WILLIAM F. ROSE

CASTINGS shown in the accompanying illustrations are typical of a widely diversified line of high test and alloy irons molded and cast in a steel foundry. Green sand facing and regular steel foundry practice are employed in the production of these castings. Over a period of three years this method has been applied to small and large gear blanks, die blocks, dampers, pots, cylinders, pressure kettles, goosenecks and other miscellaneous castings. Nearly all these castings had to be machined and were subjected to pressure, impact and heat treatment.

The Molds Are Skin Dried

Molds are made according to accepted iron foundry practice in which the molds are blacked and skin dried with a torch. The principal advantage of using steel foundry facing sand is that the mold becomes practically fool proof with a permeability of 325. No venting with a wire is necessary and the mold is rammed as hard as would be necessary for the reception of steel. The resulting casting is true to pattern and presents none of the over weight which follows soft ramming. Hard ramming also prevents runouts. The mold face does not cut or scab.

Castings are clean and smooth and present a dark blue surface when shaken out, but as a result of thorough pressure blasting are almost white when ready for shipment. Large iron castings up to 5 tons have been made in green sand molds by steel foundry molders. Steel and iron castings are shaken out over the same grating, since the same sand is reclaimed, reconditioned and used either for steel or iron casting molds. This arrangement and method of procedure greatly simplify the daily operating routine. A single sand handling unit takes care of all requirements where two would be needed under ordinary conditions.

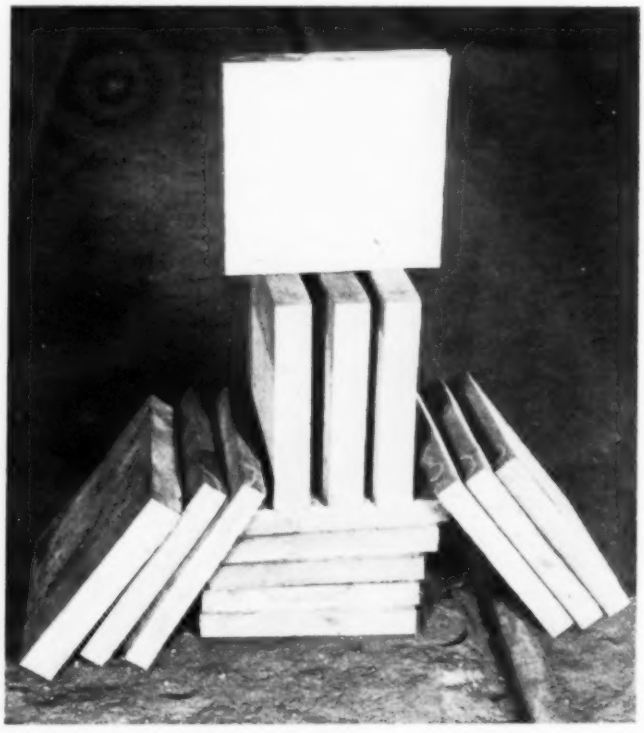


Fig. 2—Hard ramming and highly permeable sand produce clean sharp corner iron castings

When a Good Salesman Says No

Under several circumstances it may be considered good business to decline order

By ERIC N. SIMONS

THE other day a foundry salesman of my acquaintance called in at headquarters. After reporting progress to the sales manager, he went round to the purchasing agent on a little private business of his own.

"Say, Jones," he began, "Who's getting your orders for belting these days?"

"Brown & Co., of course. There isn't a belt on the market like theirs."

"What about Blank's?"

"O.K., but not so good for us as Brown's."

"Well, see here, Jones, I want you to give Blank a share of your business. They've promised to place their castings with us if we'll give them something in return. It's a nice line, and I'd be real glad to open an account with them."

Jones looked serious. "That's O.K. for you," he answered, "But where do I come in? My job's to buy the stuff that gives us the best results. I'm sorry, big boy, but there's nothing doing."

The salesman, enraged, went back to the sales manager, and for the first time mentioned the bargain he had made with Blank.

"And that fool Jones won't even promise to give them a share of our orders."

The sales manager leaned back in his chair and said with emphasis:

"Jones is quite right. You never ought to accept or even consider accepting orders on those terms."

So saying, he proceeded to explain why. This little incident is typical of many such that occur from day to day in the complicated affair of selling castings, and shows a state of mind on the salesman's part that needs correcting. In the first place, what should induce orders primarily is not reciprocity, personal friendship, influence, bribery, or flattery, but the value of the castings. In the long run that is the one thing that ensures continuous orders. If a salesman accepts an order on any other basis, it is because he either is not convinced that his goods are worth the cost, or because he is so harried by his employers that he feels he has to get orders, regardless of the method.

When the purchasing agent makes the giving of an order conditional upon some other eventuality, it means that he, too, is not buying castings because he believes in them, but because he can obtain an immediate advantage. But the weakness of offering the purchaser an immediate advantage is that someone else may come along at any moment and offer a still greater advantage, with the result that orders are transferred to the highest bidder.

The author does not overlook the fact that to offer the purchaser an irrelevant inducement to place orders is one of the easiest ways of selling castings. This explains why it is practiced so often. But it is not good salesmanship, and ultimately it is not good business.

Let us see what happens in the buyer's mind. If Jones gives way, and orders his belting from Blank for the sake of the reciprocal account, he is convinced in his own mind that he is not buying Blank's belting because it is good, but because he wants their business. He loses interest in the actual performance of Blank's goods, but every time there is a chance of complaining of their quality, he makes full use of it. If he gets half a chance, he gives up placing his orders with that firm.

Lack Faith in Castings

Too many foundry salesmen put themselves in the position of humble supplicants for orders. They are either driven to this by undue pressure on the part of their employers, or by a complete lack of faith in the castings they are selling. The consequence is that they send in plenty of pettifogging little orders given out of charity, or as a sprat to catch a whale, and seldom or never get hold of the really big business that needs expert salesmanship to secure.

The proper procedure for the foundry salesman confronted with the offer of an order on conditions that have nothing whatever to do with the value of the castings is unhesitatingly to refuse to accept it, and in this refusal his employers should, with equal lack of hesitation, back him up. Acceptance of an order of this sort implies an admission by the salesman that all his selling arguments are valueless, and that there is really no genuine difference between his castings and others (*Please turn to page* 75)

Questions and Answers

Covering important problems found in all phases of modern foundry practice

This department includes problems relating to metallurgical, melting and molding practice encountered in making castings. Questions from subscribers addressed to the Editor of The Foundry will be answered by members of the editorial staff, supplemented where occasion requires by the advisory staff.

Casting Design Presents Difficulties in Production

We make a bronze casting, 87 per cent copper, 7 per cent zinc, and 6 per cent tin. Our customer insists on that mixture to withstand salt solution. We have difficulty in getting a perfect casting, as the metal draws at some point in the casting. We make an oil core as weak as we can, and still the casting will blow or shrink. Is there any other formula which we might use and still meet the requirements of our customer, who manufactures a machine for canning purposes?

The alloy of 87 per cent copper, 7 per cent zinc and 6 per cent tin should not present any extraordinary problems in the production of sound castings, except possibly the need for increased riser sizes, since the shrinkage of this alloy might be a little more than 85-5-5-5, for example.

We believe your problem lies largely in the casting your customer demands. It is a relatively difficult casting, since the core is entirely surrounded by metal and apparently there are many sharp corners where shrinkage is accentuated. This core must be made from a sand mixture that will vent itself freely, and every care should be taken to see that the vents lead directly to the vents in the core prints, so that every possibility of blow is reduced to the minimum. The corners of the core should be well filleted and if the customer objects to this, it should be explained that this is absolutely necessary to insure soundness of the casting.

Gating should be planned so as to lead the metal into the mold quietly and yet as rapidly as possible so that a minimum pouring temperature is demanded. The colder the metal is poured (within reason), the less burning of the core itself and, therefore, the smaller amount of gases to be taken care of from the core. The mold should be well vented. The fact that your castings are shrinking and presumably the risers thereon are shrinking nicely, indicates that your melting practice is relatively good. If you must substitute some other alloy for this purpose, you should find out from your customer just what he means by the "withstand salt solution," because to withstand any type of solution, one has to know how strong these solutions are, what their temperature may be, and any other details that might influence their effect upon the castings in service.

Hydrant Jacket Cores Must Be Packed To Uniform Density

We make hydrant jackets or frost casings from 7 feet 6 inches to 9 feet in length. Some of these castings crack in the middle while others are perfect. The core sand for the cores is packed on cast iron barrels while the barrels revolve on a pair of horses. The barrels are provided with rows of small teats to retain the sand on the surface. The cupola charge is made up entirely of No. 1 machinery scrap. We shall appreciate your opinion on whether the cast iron core barrel, or the lack of pig iron, or a combination of both is responsible for the cracked castings.

In this particular instance the lack of pig iron is not a factor. The castings are harder than if a certain amount of pig iron was incorporated in the mixture, but since they are not machined, the composition practically is immaterial. Since you are using cast iron core barrels we assume that the cores are green sand. This is the practically universal custom.

Where castings of this character are made in considerable numbers the sand from a height of 6 to 8 feet falls on the revolving barrel and becomes packed to a uniform density. In the event that you are packing the sand by hand a considerable degree of skill is required to insure uniform density. Soft areas here and there are pressed inward by the metal and the resulting bulges prevent the casting from contracting normally. You can verify this point by breaking the casting and examining the inside surface.

Also you probably will find that the thickness of metal is greater in the bottom than in the

top of the casting. This means that the pressure of this metal has reduced the clearance between the inside surface of the pipe and the points of the teats. Possibly an examination will show that there is not enough sand for clearance at the constricted neck of the pipe at both ends. The result is that the ends of the casting grip the arbor too tightly. This point is even more important if you are using a core sand mixture and drying the cores. Finally a possibility exists that you do not secure a tight fit between mold and core at the ends. A fin at these points will hold the ends of the castings and prevent normal contraction.

Poling Poor Substitute For Metallic Deoxidizers in Brass

Please give the advantages gained by poling red brass with green poles? What kind of wood is best suited for that purpose?

Poling molten metal by the submersion of a green pole in the bath is a practice that is used largely in refining of ores. The action is the liberation from the burning pole of strongly reducing gases, which bubble up through the bath and combine with the oxygen, which has been united with the metal in the bath in the form of metal oxides. The gases reduce the oxide back to elementary metals and free the bath of its occluded oxides.

In the process of refining copper for example, the bath first is highly oxidized by bubbling air through it, causing all of the metals, including the impurities, as well as the copper, to become more or less oxidized. These oxides are carried to the surface by the bubbling and by the fact that they are lighter than the bath itself. A slag is maintained on the surface of the bath in which, for example, iron oxide is soluble, but copper oxide is not very soluble. This frees the bath of the iron content in the ore. After this step, poling is resorted to as previously described, thus refining the copper by alternate oxidation and reduction.

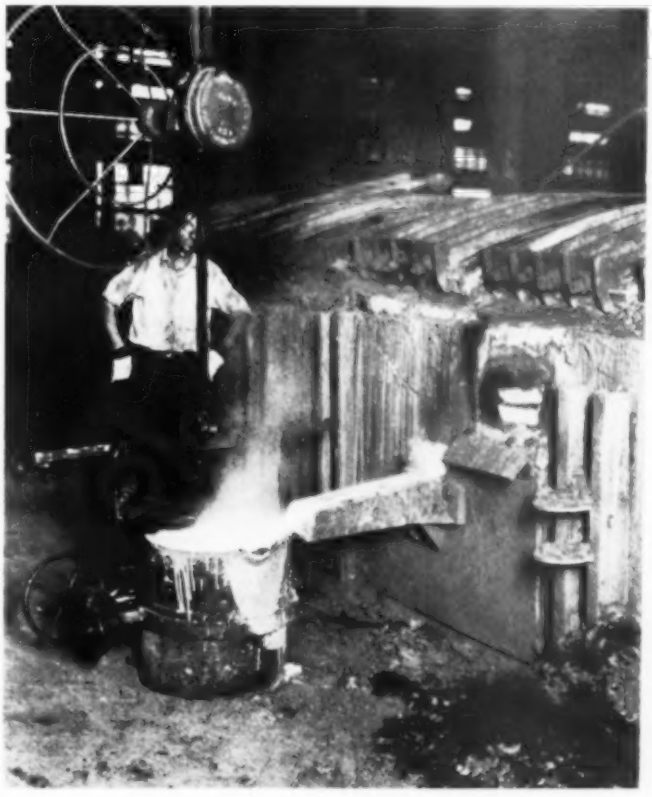
Therefore, the use of poling of brass is a doubtful step since in the brasses there is contained zinc, which is a powerful deoxidizer, lead, which is a less powerful deoxidizer, but does deoxidize to some extent, as does tin. Phosphorus, however, is the most common and more effective deoxidizer used in the brass foundry regularly and, therefore, poling of brass is nothing but a substitute for more effective deoxidation by the inclusion of phosphorus or metallic deoxidizers. In the refining process, these other metallic elements are not present intentionally and if they are, they are undesirable impurities as the product is intended to be a pure metal.

A further objection to the poling of brass in the process of melting is the fact that the bubbling resulting from the insertion of the pole, splashes the metal out of the crucible and consequent loss is incurred.

Aluminum Casting Shrinks Through Lack of Proper Vents

We are forwarding a small aluminum casting in which a thin flat plate forms the top of a slightly thicker vertical member. Defective areas show on both sides of the vertical member immediately below the horizontal plate. We melt the metal in an iron pot fired with oil. The pot is coated on the inside with a thin wash of fire clay and the trouble seems to be accentuated when this coating blisters and peels off. Do you think absorption of iron from the pot causes the trouble?

Pot linings and melting methods are responsible for certain forms of defects in aluminum castings, but in this particular instance the fault lies in the mold. The defect is a combination blow and shrink. The sand is a little too hard and a little too damp in the corner where the vertical member joins the horizontal plate. The confined steam cannot escape readily when the metal covers the horizontal area and some of the steam enters the metal. The remedy is to ram the sand more softly in that area and as a further precaution the corner should be vented with a wire. An additional safety factor would be to place a heavier gate at the point where the vertical member joins the plate. Through a larger gate the metal may be poured more slowly to prevent a strain.



A ladle cover holds the heat of the metal during transportation from the furnace to the mold

Blast On and Off Does Not Affect Iron

Several times during the heat we have to shut off the blast on the cupola because the iron comes down faster than we can handle it. Do you think this practice has a deteriorating influence on the metal?

Where the blast is shut off a sufficient length of time it will affect the temperature of the metal to some extent, but will not affect the physical properties of the castings. Conceivably the blast might be shut off for several hours and in that time the bed might be lowered too far. The resulting iron would be cold and oxidized. However, instances are on record of cupolas which have been banked for 20 hours on account of breakdowns of one kind or another. Shutdowns of 3 or 4 hours are not uncommon.

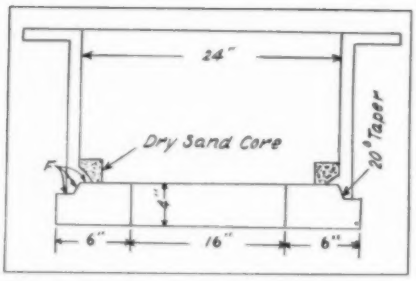
The regular practice in shops where the cupola is in operation all day, is to shut off the blast during the lunch period. Intermittent stopping of the blower for periods of 10 to 20 minutes will not affect either the temperature or character of the iron, provided the supply of coke is not cut too fine. The practice, of course is not recommended since a cupola works most efficiently when operated steadily. In your case, for example, where the cupola melts iron faster than it can be taken away, we suggest an extra lining of brick for a distance of 4 or 5 feet above the tuyeres. This will reduce the melting speed to a point where probably you can take the iron away as fast as it is melted.

Frames Chilled To Prevent Wobbling

In a recent issue of THE FOUNDRY reference was made to the use of a chill on man hole frames to secure an even seat and prevent the cover from wobbling. Can you give us a description of one of these chills as applied to a 24-inch man hole frame. We pour these castings in open sand and are wondering if we shall have to change the system of gating so that the hot metal will not affect the chill.

A suitable chill for the purpose outlined is shown in the accompanying illustration. It is 28 inches in diameter, and 4 inches thick with a 16-inch opening in the center. It may be cast in an open sand mold and later machined on the face. The comparatively massive construction will insure rigidity and prevent distortion. A lighter chill would serve satisfactorily for one or perhaps two castings, but afterward it would twist out of shape and would not confer a true seat on the man hole casting.

A taper of approximately 20 degrees



Sectional view showing dimensions and application of the chill to form the seat in the manhole casting

on the vertical face of the shoulder will prevent the casting from cracking during contraction. However, as a precautionary measure the casting may be moved upward from the chill immediately after it has set, by inserting a pinch bar under the flange. The chill remains permanently on the floor and is given a coating of oil, of oil and blacking, or of a special preparation used by chill car wheel makers, each day before the mold for the man hole is made. Your present method of gating need not be changed. If the casting shows wrinkles or streaks in the area which comes in contact with the chill, you will have to pour the iron faster, or hotter, or perhaps both. Precaution also must be taken to see that the chill is perfectly dry. Any dampness will cause an explosion when the molten iron comes in contact with it.

Secure Hard Iron In Moldboard Casting

We make a mold board casting for a plow occasionally and will appreciate your opinion on the most convenient method of hardening the iron.

In foundries where mold boards are made in quantity, a low silicon iron mixture is melted in the cupola and poured into combination sand and chill molds. The chill forms the drag and the sand forms the cope. You are confronted with a different problem, where presumably all or nearly all your castings must be poured from machinable iron. It is not feasible to place a special charge of—say—1000 pounds in the cupola to pour a 25-pound casting.

What you have in mind, probably is a method of dosing a single hand ladle of ordinary gray iron to pour this particular casting. This can be done by adding approximately 0.75 per cent ferrochrome. After one or two experiments you can decide on exact amount for this particular casting. Commercial ferrochrome contains approximately 70 per cent chrome. Therefore 1 pound of the material is added to 100 pounds of iron in a shank ladle or ½ pound to 50 pounds in a hand ladle.

Ferrochrome has a high melting point and it is customary to raise it to as high a temperature as possible before adding it to the metal in the ladle. This can be done in a stove, a forge fire or in any other convenient manner. The heated ferrochrome is placed in the metal and then stirred vigorously. If it is placed on the bottom of the ladle some of it will stick.

On certain occasions you may have a sufficient number of hard iron castings to make to justify a complete charge in the cupola. You might make up a number of mold boards and pour them at this time. As a possible third alternative we might suggest that unless you have to meet unusually severe specifications, the ordinary run of gray iron ⅜ or ½-inch thick poured against a chill will produce a casting hard enough to meet your customer's requirements.

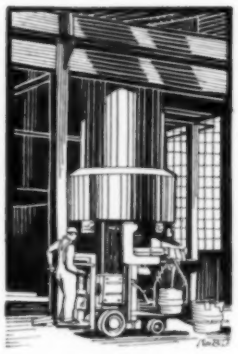
Melting Loss Is Difficult To Determine

We will appreciate information on what should be the normal shrinkage in a cupola due to the oxidation of metal in a 60 x 72 inch unit melting gray iron. Our normal mix contains 500 pounds of pig iron with 2.25 per cent silicon; 100 pounds of pig iron with 2.15 per cent silicon; 150 pounds of steel rail scrap, and 600 pounds of cast iron scrap with 1.50 per cent silicon. The average manganese is 0.70 per cent.

While in general the usual melting loss is considered to be 5 percent, it is extremely difficult to determine exactly what it should be because there are so many factors to be included in the final summation. If sand-cast pig iron is used, the loss will be higher than in the case of machine-cast pig iron because any sand adhering to the pigs will be weighed in as iron. Also, if the sprues, gates, defective castings, etc. are not cleaned the same thing will occur. Rusty scrap will show a higher loss than clean scrap and a poorly operated cupola will increase the loss.

The usual way of determining the melting loss is to weigh all the castings with their sprues, gates, etc., and subtract that value from the total iron charged into the cupola. However, this is not correct because it is not unusual to find varying amounts of iron in the cupola drop, and sometimes considerable iron is spilled or spattered around the floor when the iron is taken from the cupola, and when it is being poured. Also any over-iron poured in the pigbeds must be considered. Consequently, you can see how difficult it is to determine an essentially correct value for melting loss.

Viewing Foundry Developments



At Short Range

A MANUFACTURING establishment, employing in its office and engineering department a total of 50 persons, adopted a suggestion made by an employe for promoting punctuality and regularity. This plan provided for three half day holidays in addition to the regular yearly vacation period for all those maintaining perfect records. The average tardiness for the entire group was but four and the average number of days absence for the entire year was two.

• • •

An old time foundryman familiar with the use of stale beer, horse dung, etc. in molding practice should not be surprised to hear that the latest addition is powdered skim milk. According to a recent patent 12 parts of powdered skim milk, 1000 parts of sand, and 60 parts of water will make cores which have an extremely hard shell and soft, porous interior. Also it is claimed that material may be used in conjunction with core oil.

• • •

MAGNESIUM is added to aluminum in stick form after the rest of the alloy has been melted. Sticks are gripped with tongs and held beneath the surface of the metal until melted. Any pieces that may rise to the surface must be pushed down.

• • •

Cylinders weighing 7000 pounds each, cast from alloy steel containing 2 per cent nickel, will be used on a high powered locomotive being built by the Great Northern railroad for use on steep grades.

• • •

While the melting point of pure aluminum is 1220 degrees Fahr., alloys generally melt at a slightly lower temperature. For example the 8 per cent copper alloy melts at 1170 degrees Fahr. and the 12 per cent copper alloy at 1120 degrees Fahr. These aluminum-copper alloys have a comparatively wide range of solidification and are not completely solid until cooled below 1005 degrees Fahr.

• • •

ADDITION of calcium so that 0.1 to 1.0 per cent is retained in nickel-copper, and in nickel-copper-silicon alloys, has an extremely beneficial effect, according to a recent patent. It increases fluidity, refines grain, minimizes red shortness, provides age hardening, and reduces shrinkage. In an alloy containing 1.75 to 3.25 per cent silicon with the remainder comprised of nickel and copper in equal amounts, it may be quenched in water, air or oil from 1350 to 1600 degrees Fahr. without cracking, so that it may be machined, and after aging for 8 hours at 900 to 1200 degrees Fahr. the original hardness or better is obtained.

• • •

Irons containing about 15 per cent chromium resist oxidation up to approximately 1500 degrees Fahr., and the presence of 25 per cent chromium will extend the range of oxidation resistance to 1800 degrees Fahr. Castings containing high percentages of chromium are suitable for door frames, grate bars, pit covers, door castings, conveyor parts, etc., where conditions require resistance to oxidization and growth.

• • •

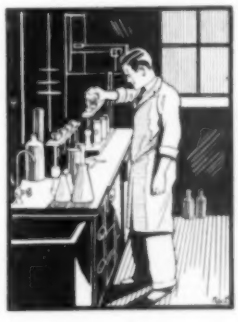
Improvement in physical properties of cast iron through addition of chromium, tungsten and vanadium with suitable heat treatment is outlined in a recent patent. From 0.10 to 5.0 per cent of those elements may be added with a preferable range from 0.10 to 0.75 per cent. Heat treatment is conducted at temperatures from 900 to 1900 degrees Fahr.

• • •

WITH the Brackelsberg, rotary powdered coal type furnace, the temperature of the metal is 2850 degrees Fahr. With air preheated from 500 to 100 degrees, any practical melting temperature can be attained. On gray iron melting, the cost of pulverized coal is approximately 85 cents per ton of iron melted. Power cost is from 10 to 25 cents per ton, depending on the size of furnace and the local current rates. Refractory cost is said to be 35 to 40 cents a ton.

• • •

In cases where one metal becomes contaminated with small amounts of another, it can be removed by oxidation if the proper agents are used. That is shown in a recent patent in which moistened barium peroxide in briquet form is employed to oxidize tin from an alloy of 99 per cent copper



and 1 per cent tin. The tin oxidizes more rapidly than the copper, and the oxides formed combine with the barium oxide and hydroxide as fusible compounds which are said to be easily fluxed off.

• • •

Several automobile manufacturers will follow Oldsmobile in using a one piece die casting of a zinc base alloy for the radiator grille. Buick is reported to be using a die cast grille on its new model to be shown about Aug. 1.

The FOUNDRY Family Photograph Album

Upper Left

PROF. A. PORTEVIN
Ecole Superiore de Fonderie
Paris, France

Upper Right

G. P. PHILLIPS
International Harvester Co.
Chicago

Lower Left

A. M. ONDREYCO
Mechanite Metal Corp.
Pittsburgh

Lower Right

CLYDE E. DAVIS
Homestead Valve Mfg. Co.
Coraopolis, Pa.

Men of Industry

Whose Activities Are Making Foundry History

GARNET P. PHILLIPS (see Foundry Album on page 38) has resigned as metalurgist of the Frank Foundries Corp., Moline, Ill., to become metallurgist of the International Harvester Co., with headquarters at its tractor plant in Chicago. Mr. Phillips attended the schools of Terre Haute, Ind., and was graduated from Rose Polytechnique institute, Terre Haute, in 1925 with a B. S. degree in chemical engineering. From 1925 to 1926 he was a research fellow at Carnegie Insttute of Technology, Pittsburgh, and received his master of science degree from there in 1926.

Since 1926 he has been employed by the Frank Foundries Corp. in charge of melting, sand control, laboratory and heat treating. During that time he has undertaken special work on molding methods, gating and risering, research on alloy irons melted in the cupola and electric furnaces, and composition, properties and application of gray iron castings. Mr. Phillips is a member of the American Foundrymen's association, the American Society for Metals, American Society for Testing Materials, and the Quad-City Foundrymen's association. He is the author of several articles in THE FOUNDRY and has presented several papers before the A.F.A. and A.S.T.M.

DONALD MCDONALD, recently associated with Aluminum Industries Inc., Cincinnati, has been named a vice president of that company.

HUGH MORROW, president of the Sloss-Sheffield Steel & Iron Co., Birmingham, Ala., has been reelected a director of the Birmingham Electric Co.

N. W. PICKERING, president, Farrell-Birmingham Co., Ansonia, Conn., sailed recently for a few months trip which will take him to a number of countries in Europe.

DAN LEWIS has been appointed manager of the roll department of the Continental Roll & Steel Foundry Co., East Chicago, Ind., with headquarters in the Grant building, Pittsburgh. W. E. CADMAN has been named assistant manager, being located at the Hubbard Steel Foundry division, East Chicago.

JOSEPH W. ROYER, works manager, Medart Co., St. Louis, recently was elected vice president in charge of manufacturing. Mr. Royer has been connected with that company since 1915.

WILLIAM M. HAGER recently was elected a vice president of the American Car & Foundry Co. HOWARD C. WICK was appointed assistant to the president, but also will continue as secretary.

FREDERICK W. BIERWIRTH recently was elected vice president of the Western Electric Co., Chicago, succeeding the late Stanley S. Holmes. Mr. Bierwirth has been connected with that organization since 1912.

WILLIAM C. FARR, president of the McKinney Mfg. Co., Pittsburgh, in 1928, and since, secretary and treasurer, was honored on his fiftieth anniversary with the company, April 17, with presentation of a silver plaque.

ROBERT SCHAAL, for over 8 years associated with the Roberts & Mander Stove Co., Hatboro, Pa., has been appointed to handle special work for the Ferro Enamel Corp., Cleveland. He has sailed for England on a special assignment abroad.

H. A. SCHWARTZ, manager of research, National Malleable & Steel Castings Co., Cleveland, is the author of the annual exchange paper of the American Foundrymen's association to be presented before the Association Technique de Fonderie de Belgique, Sept. 20 to 25, 1935.

JAMES C. OGDEN, formerly vice president in charge of eastern and foreign activities, has been made president of the Robert W. Hunt Co., Chicago, succeeding C. B. NOLTE, recently made president of the Crane Co. Mr. Ogden has been connected with the organization for the past 35 years, and in an executive capacity since 1908.

F. M. RANDLETT, formerly Pacific coast manager, Robert W. Hunt Co., has been made vice president and general manager of the company with headquarters in Chicago.

M. H. MERRILL has been made western manager of the company with headquarters in San Francisco. Since 1919 Mr. Merrill has been president of the M. H. Merrill & Co., consulting engineers, and during the last 3 years has served as a consulting engineer in San Francisco for the Robert W. Hunt Co.

GEORGE BATTY, technical director, Crucible Steel Castings Co., Lansdowne, Pa., is the author of the 1935 annual exchange paper of the American Foundrymen's association to the Institute of British Foundrymen. The title of the exchange paper is "Controlled Directional Solidification of Steel Castings."

OLIVER F. REDD has become connected with the research department, Patterson Foundry & Machine Co., East Liverpool, O. Mr. Redd received his education at the University of Illinois, University of Chicago and the Southern Illinois normal, and for several years has been engaged in development of engineering work in the Bell Telephone Co. laboratory in Chicago.

A. M. ONDREYCO, (See Foundry Album on Page 38) recently made chief metallurgist, Meehanite Metal Corp., Pittsburgh, has been elected president of the Pittsburgh Foundrymen's association. Mr. Ondreyco was graduated from the Carnegie Institute of Technology, Pittsburgh, and then was employed as chemist with the Firth Sterling Steel Co. He then spent 4 years with the United States bureau of

mines, and 1 year as metallurgist for the New Process Copper Casting Co. From 1924 to 1934, Mr. Ondreyco was operating metallurgist and advisor for the Westinghouse Air Brake Co., Pittsburgh.

ANTON TANZER has been made metallurgist of the Frank Foundries Corp., Moline, Ill. Mr. Tanzer was born in Germany and was graduated from the technical college in Gratz, Styria. He then undertook 2 years of postgraduate work in metallurgy at the University of Vienna. During the past 12 years he has had experience in automotive foundries in the Detroit district, especially in the operation of the cupola and electric furnace.

W. G. REICHERT, metallurgist, Singer Mfg. Co., Elizabethport, N. J., is the author of the annual exchange paper of the American Foundrymen's association to be presented before the French foundry association. Mr. Reichert will discuss the subject, "The Present Position of Methods of Investigation and Control of Molding Sands." The French association convention will be held in conjunction with an international congress of mines, metallurgy, and geology.

HAROLD R. KING recently has accepted a position with Jenkins Bros., Bridgeport, Conn., in connection with nonferrous metallurgical research. Mr. King was graduated from Howe school, Howe, Ind., and attended Armour Institute of Technology, Chicago. In a period of 12 years, he has been assistant metallurgist with the former Chicago Bearing Metal Co., assistant metallurgist with the Bunting Brass & Bronze Co., Toledo, and metallurgist in the methods department of a large copper and brass rolling mill in the eastern section.

SYDNEY G. MCALLISTER, recently first vice president of the International Harvester Co., Chicago, has been elected president, succeeding ADDIS E. MCKINSTRY who has resigned because of poor health. Mr. McAllister has been affiliated with the company since 1897 when he became an office boy at the McCormick works, Chicago.

Following rapid promotion in the manufacturing division, Mr. McAllister was made superintendent of the company's Auburn, N. Y., plant in 1911 and 3 years later was transferred to Europe. Upon his return to this country in 1931 he was elected a vice president. Since last May he has been first vice president. Mr. McKinstry, who had been associated with the International company and its predecessors for 49 years, continues as a director.

CLYDE E. DAVIS, (see Foundry Album on page 38) superintendent, Homestead Valve Mfg. Co., Coraopolis, Pa., and retiring president of the Pittsburgh Foundrymen's association, has been active in association work for the past 7 years. Recently he was elected president of the Nonferrous Foundrymen's association, Pittsburgh.

During his 10 years connection with the Homestead Valve Mfg. Co. as general superintendent, Mr. Davis had a broad experience in production of high test gray iron castings as well as pressure bronze and monel metal castings. A discussion of the production methods of that plant appears on page 24 of this issue of THE FOUNDRY.

Prior to his connection at Coraopolis, Mr. Davis was engaged in selling work for five years.

Professor Albert Portevin (see FOUNDRY Album on page 38), recently awarded the Bessemer gold medal of the British Iron and Steel institute for 1935—THE FOUNDRY for April—is director of Institut de Soudre Autogene and professor at the Ecole Superiore de Fonderie and the Ecole Centrale des Arts et Manufactures in Paris, France.

His name and work have become well known in international metallurgical fields and he has written extensively in technical literature. Receiving his early training at the Ecole Centrale, from which he graduated in 1902, he spent a short time in the technical department of the Credit Lyonnais, a bank, and afterward entered the Societe Metallurgique de la Bonneville, where he became familiar with the study of steel, copper and brass.

Later he worked in co-operation with Prof. Leon Guillet in laboratories of the automobile works at De Dion, and through reports of his metallurgical investigations attracted attention of Osmond and Henry Le Chatelier. As a result, he was appointed general secretary of the French publication, *La Revue de Metallurgie*, in 1907. He has now published about 300 papers, including 80 read before the French Academie des Sciences.

Papers published by Prof. Portevin since the World war cover a variety of subjects, such as structure of alloys, dilatometric investigations, influence of cooling rates on hardening of steel, heat treatment of light alloys, inclusions in steel, corrosion by chemical action, and steels alloyed with chromium, aluminum, zirconium, nickel-molybdenum and nickel-tungsten.

A recipient of numerous medals in past years, he is currently president of the French association for testing materials, vice president of the international association for testing materials, and president of the international committee on testing cast iron.

Organize Association In Northern Iowa

Northern Iowa Foundrymen's association was organized at Waterloo, Iowa, on March 26, with the following officers: President, John C. Keil, John Deere Tractor Co., Waterloo; vice president, W. E. Robinson, Headford Bros. & Hutchins Foundry Co., Waterloo; secretary-treasurer, Harry Maitland, Viking Pump Co., Cedar Falls, Iowa; executive committee, J. C. Lund, F. C. Nus, E. H. Huss, Frank Eastman, and Harry Miller.

The constitution and by-laws were adopted and the decision was made to hold monthly meetings on the last Tuesday of each month.

An interesting talk was presented by V. A. Crosby, Climax Molybdenum Co., Detroit, on improvements obtainable in gray cast iron through the application of alloys. He provided a number of slides showing the structure of good cast iron, and presented data on the chemical and physical properties of a number of different irons having allow additions of various kinds.

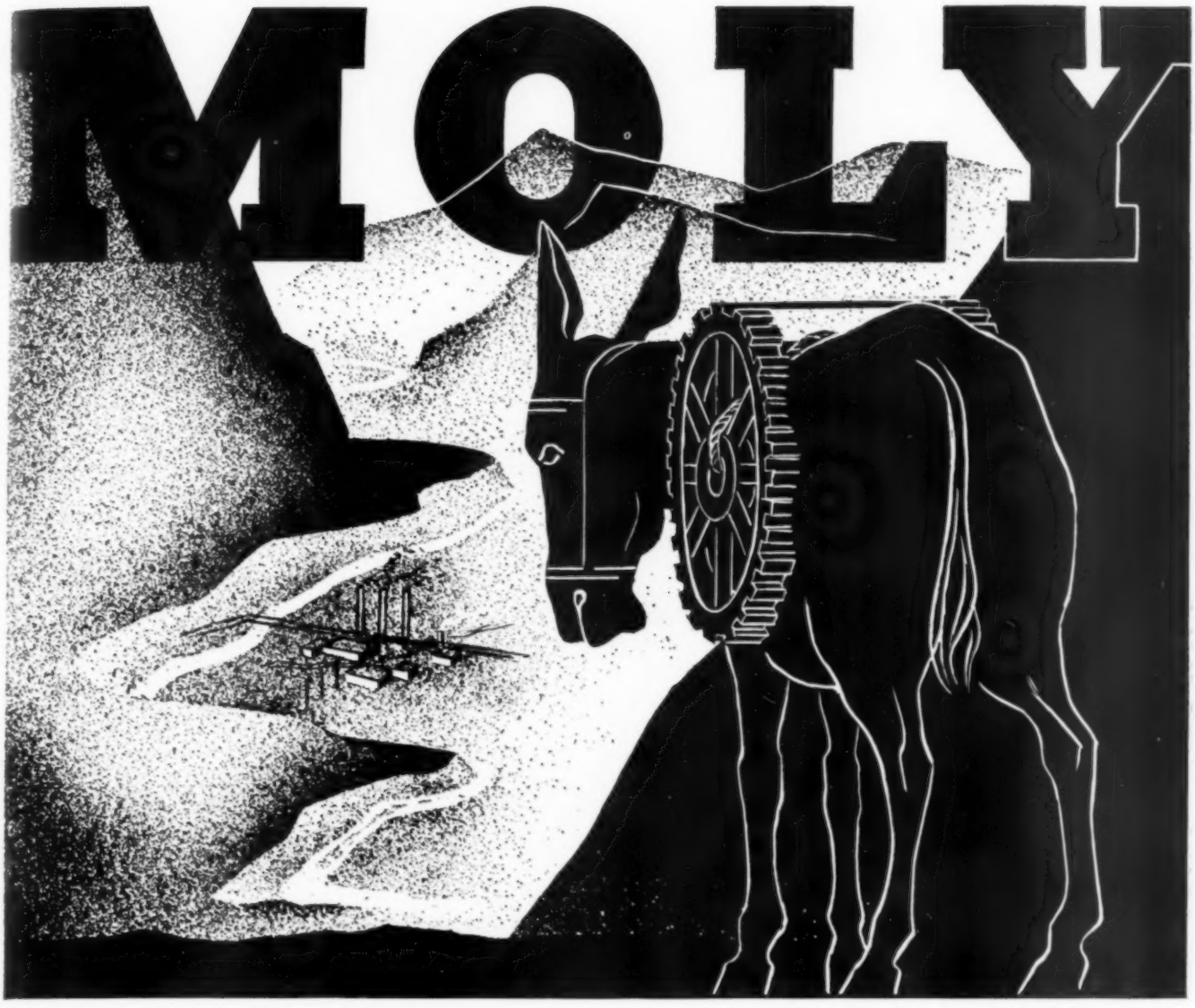
Pittsburgh Association Nominates Officers

Following dinner which was served in the Carnegie Institute of Technology Inn, Monday evening, April 15, the Pittsburgh Foundrymen's association held its April meeting and was addressed by Professor C. C. Leeds of the department of industrial engineering at Carnegie Tech.

Professor Leeds has conducted considerable practical foundry research among students at this institution and spoke before the association on, "Some Laws of Manufacturing Management Pertaining to Economical Production." Members present were given an opportunity to observe several foundry layouts and problems as instituted by some of Professor Leeds' students. Following the speech, A. M. Ondreyco, Meehanite Metal Corp. and vice president of the Pittsburgh Foundrymen's association, led the discussion on that interesting subject.

The Pittsburgh Foundrymen's association's nominating committee has placed in nomination Mr. Ondreyco for presidency of the association over the coming year. W. H. White, Pittsburgh Rolls Corp., has been nominated for vice president.

(*Concluded on page* 42)



where replacements are costly

A STAMP MILL in a trackless Andean interior. . . . Picture the time and money losses involved in parts replacements under such circumstances! And yet there are literally thousands of nearby instances — in industrial, engineering, oil, mining and other projects — where replacement problems are no less serious . . . where inaccessibility, removal and installation difficulties, labor, transportation, shutdowns and what-not exact heavy tolls . . . where mechanisms ought to be qualified to let their users "put them to work and forget them."

Hence, where replacements are costly there should be no compromise with quality. . . . The unquestionable "best" in irons and steels is ultimately the least expensive. Toward attaining it the various alloying elements and combinations become a subject for intensive consideration. *There are hundreds of cases in which Molybdenum's addition to, or substitution for, other alloys has bettered products.* Results have proved that the increase in life is attained at the lowest possible cost.

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CLIMAX Mo-lyb-den-um

(*Concluded from page 40*)

and C. H. Paul, Mackintosh-Hemphill Co., secretary and treasurer.

Executive committee nominations are: C. E. Davis, Homestead Valve Mfg. Co.; H. M Wilson, Taylor-Wilson Mfg. Co.; H. P. Spilker, Sterritt-Thomas Foundry Co.; F. C. T. Daniels, McIntosh-Hemphill Co., and S. B. Cuthbert, Carnegie Steel Co. Elections will be held at the May meeting. This gathering will be devoted to a nonferrous foundry subject.

Preliminary announcement has been made for the Pittsburgh Foundrymen's association's annual picnic to be held Monday, June 17, at the Alcoma country club, Pittsburgh. Details will be announced later. This concludes the monthly gatherings of this association until next September.

Important Subjects To Be Discussed At Gray Iron Industry Meeting

TENTATIVE program for the meeting of the gray iron foundry industry to be held at Cincinnati on June 6 and 7, has been announced by Henry M. Halstead Jr., executive vice president of the Gray Iron Founders' society and national code authority for the gray iron foundry industry. The program contains a number of nationally known speakers who will discuss subjects of special interest to the foundry industry at this time.

James W. Hook, president, Geometric Tool Co., New Haven, Conn., will discuss various aspects of current business and political questions, as seen by an industrialist outside the foundry field. Mr. Hook is especially qualified to discuss such questions due to his leadership in the industrial field, and to his activities as a member of the Durable Goods Industries committee, National Association of Manufacturers, NRA Industrial Advisory board, etc.

Prof. Olin Glenn Saxon, professor of business administration, Yale university, New Haven, Conn., will discuss the effect of some of the New Deal activities on business in general. Professor Saxon has conducted considerable research in the various phases of the complex question and is well qualified to discuss both the good and the bad phases of economic experiment.

The industrial meeting will open at 9 o'clock on Thursday morning, June 6, with an address of welcome by one of the officials of the city of Cincinnati. This will be folllowed by discussion on certain specific subjects of special interest to the members of the gray iron foundry industry. Tentative program for the morning session on Thursday, with F. R. Hoadley, president of the Gray Iron Founder's society, and chairman of the code authority, presiding.

Reports of officers:

F. R. Hoadley, vice president, Farrel-Birmingham Co., Ansonia, Conn., president of the society.

R. D. Phelps, vice president, Francis & Nygren Foundry Co., Chicago, treasurer of the code authority.

"Public Prices"

(a) F. A. Lorenz Jr., vice president, American Steel Foundries, and president of Steel Founders' Society of America.

(b) Robert W. Irwin, president, R. W. Irwin Co., Grand Rapids, Mich.

(c) Floor discussion

"Costs"

(a) "Activities of the Cost Committee," by John L. Carter, cost advisor of the code authority.

(b) "Value of Uniform Cost Accounting Methods to Members of the Industry and to Industry as a Whole," by Peter E. Rentschler, president, Hamilton Foundry & Machine Co., Hamilton, O.

(c) Floor discussion

"The Value of an Organized and United Industry," by F. R. Hoadley.

Program for the afternoon session, with C. B. Magrath, president, Northwestern Foundry Co., and Greenlee Foundry Co., Chicago and vice president of the Gray Iron Founders' society, presiding:

"Merchandising," by George L. Willman, president, George L. Willman Inc., Chicago.

"Scientific Progress in the Gray Iron Foundry Industry," by Hyman Bornstein, Deere & Co., Moline, Ill.

"Silicosis," by W. H. Winters, vice president, American Brake Shoe & Foundry Co., New York.

"Resume of Executive Office Activities," by H. M. Halsted Jr., executive vice president, code authority and the Gray Iron Founders' society, Inc.

"Chapter Activities," by Frank W. Carter, president, Fillmore Foundry Co., Buffalo.

"Sale of Castings at per Piece rather than per Pound," by W. H. Hoppenjans, president, Star Foundry Co., Covington, Ky.

"Apprentice Training"

"Standard Specifications"

Friday, June 7, will be devoted to business meetings and special group meetings, with F. R. Hoadley, presiding. The program for that day is as follows:

Election of two nonmember representatives on National code authority.

Meeting of Gray Iron Founders' society, with entire Industry invited.

Election of Directors.

Officers' reports.

President's report — F. R. Hoadley

Treasurer's report — R. D. Phelps

"Aims and Activities of Gray Iron Founders' society," by C. B. Magrath.

Special Meetings.

Meeting of district Directors of Code Authority.

New Directors' Meeting.

Election of Officers

Election of Executive Committee

Appointment of New Committee

Meeting of Old and New Code Authority.

Meeting of Chairmen of Chapters, and Secretaries.

Meeting of Chairmen of Supplemental Code Authorities.

Round Table Discussions for "special" types of Foundries, such as:

Light foundries

Heavy foundries

Automotive foundries

Plumbing and Drainage Specialty Manufacturers

Sessions will be held at the Hotel Gibson.

Approves Code Authority

National Recovery Administration has approved the code authority of the foundry equipment industry as follows: F. R. Wallace, Tabor Mfg. Co., Philadelphia; R. S. Hammond, Whiting Corp., Harvey, Ill.; S. C. Vessey, W. W. Sly Mfg. Co., Cleveland; B. C. Trueblood, Arcade Mfg. Co., Freeport, Ill.; O. C. Sabin, Steelblast Abrasives Co., Cleveland; E. O. Beardsley, Beardsley & Piper Co.; Chicago; T. W. Pangborn, Pangborn Corp., Hagerstown, Md.; D. A. Weber, Deister Concentrator Co., Fort Wayne, Ind.; and H. S. Simpson, National Engineering Co., Chicago.

Moves Pittsburgh Office

The Pittsburgh office of The Penton Publishing Co., Publishers of THE FOUNDRY, has been moved from 507 Oliver building to 1650 Koppers building.

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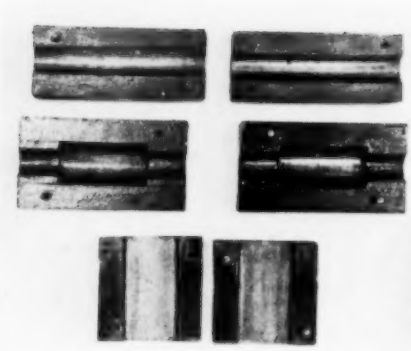

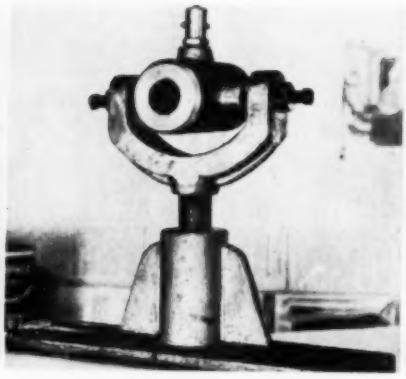

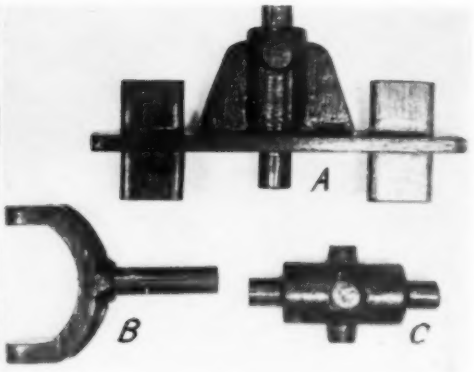

Fig. 1 (Left)—Coreboxes are made in two parts. Fig. 2 (Center)—Assembled shaft hanger. Fig. 3 (Right)—Patterns for base, yoke and box

Suggests Hangers for Fill-In Work

By FRED B. JACOBS

IN SELECTING a fill-in job for the gray iron or nonferrous foundry the product decided upon should be made readily with no great investment outlay and the product must find a ready market. For example, self-aligning adjustable shafting hangers used in home workshops offer possibilities. Those skeptical about the scope of that field should consult the advertising pages of magazines devoted to handcraftsmanship, containing page after page of advertisements of tools and appliances. As this advertising has been going on for several years it is obvious that a good market must exist. Several types of shafting hangers find their way into home workshops. The hanger shown in the accompanying illustration is designed for a standard ⅝-inch shafting. By increasing the proportions slightly the hangers can be made in ¾ or 1-inch sizes as used for general light manufacturing. In some instances ½-inch shafting is used in home workshops, but is rather light for anything except so called toy tools.

In typical home workshop installations, shown in Fig. 7, the hangers are fastened to the back of the bench with lag screws, but they readily can be used under the bench or on the wall or ceiling. A closeup view of the hanger is shown in Fig. 2, an aluminum bronze unit made for the author by the Wellman Bronze & Aluminum Co., Cleveland. Aluminum bronze is lighter than cast iron but costs considerably more per pound. Either material possesses ample strength for the purpose.

The clevis carrying the box slides in the base to permit vertical adjustment, is shown in Fig. 2, while the box is held in the clevis with a ¼-inch square head set screw on each side. Each screw is provided with a check nut. A similar set screw also clamps the clevis shank in the base. This design results in a self-aligning unit.

Dimensions for the base are given in Fig. 4. The pattern for the base, *A* Fig. 3, is provided with six core prints, two for the center core, and two each for the slot cores. Machine work on the base is confined to drilling and tapping the ¼-inch screw hole. The hole can be drilled in a speed lathe or in a drill press, tools usually found in the foundry or in the pattern shop. If the center core in the base is the correct size, the clevis spindle will slip in place readily. No machining is necessary.

Dimensions of the box, *B* Fig. 3, are shown in Fig. 8. This box is lined with babbitt metal poured through two ¼-inch holes drilled through the bottom of the box. As the babbitt fills these holes the lining is anchored in place permanently. The boss at the top is drilled and tapped for ⅛-inch pipe size to accommodate an alemite fitting. However, this fitting is optional as an oil cup, or simply, an oil hole will suffice. Grease lubrication has certain advantages. The two side bosses are drilled and countersunk to accommodate cone point set screws.

In assembling the units, the first step is to drill the two ¼-inch holes through the bottom of the box. Then the box is set up for babbitting as shown in Fig. 5. It is placed over a piece of ⅝-inch shafting and held between two standard ⅝-inch shaft collars with a leather washer behind each. The washers prevent the babbitt from running out. The box is held in the vise upside down from the position shown to bring the two

(Concluded on page 47)

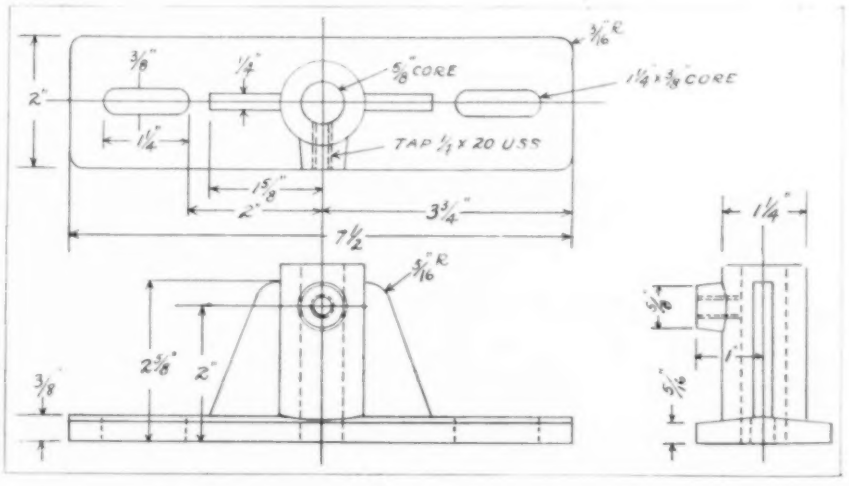

Fig. 4—Top, side and end views of base casting

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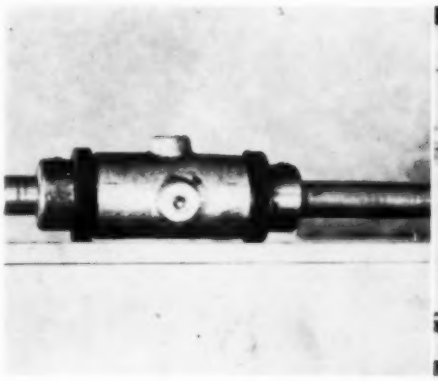


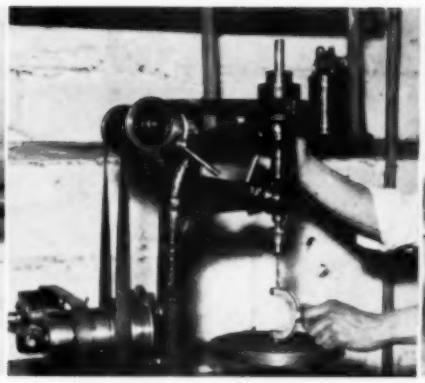


Fig. 5 (Left)—Box set up for babbitting. Fig. 6 (Center)—Drilling the yoke. Fig. 7 (Right)—Typical home work bench supporting several power driven tools

(*Concluded from page* 44)

¼-inch holes to the top. Shaft and box should be preheated with a gasoline torch or by other means before the babbitt is poured. Otherwise the metal will chill. After the babbitt has cooled the shaft readily is driven out of the box.

The two holes then are drilled and countersunk in the side bosses. Method of drilling on centers will be explained later in connection with the clevis. The last operation on the box is to drill and tap the hole at the top for the alemite connection or for other lubricating devices.

Pattern for the clevis is shown at *C* Fig. 3, while the actual dimensions are given in Fig. 9. The clevis shank is cast in place. Grooves are ground on opposite sides of the shank. The metal flows into these grooves and anchors the shank securely. The clevis pattern has a core print to accommodate this shank.

The only machine work on the clevis consists of drilling and tapping the holes for the screws. It is a good plan to drill these holes on centers as shown in Fig. 6. A drill press platen is fitted with a little center to accommodate the center punch mark made when the holes are laid out. They can be drilled on centers in a speed lathe, but the drill press is the handier tool. The tap should be started into the holes on centers, in a speed lathe. The drill press is somewhat unhandy for that operation.

The three core boxes are shown in Fig. 1. The center core for the base must be of a size to let the clevis shank enter the base without machining the hole. The shank core print on the clevis is 41/64-inch or 1/64-inch over ⅝ and the center core for the base also must be a like amount oversize. The core may shrink a little in baking, but it leaves a hole in the base to take the ⅝-inch clevis shank without machining.

In some cases it may be necessary to run a ⅝-inch hand reamer through the babbitted hole in the box, but this is not an expensive operation. It is necessary only when the babbitting mandrel, a piece of ⅝-inch shafting, happens to be a trifle undersize.

If the hangers are to be made in quantities, split patterns may be used individually or mounted on a match plate. However, in making up a few hangers to try out the market the solid patterns shown will answer the purpose.

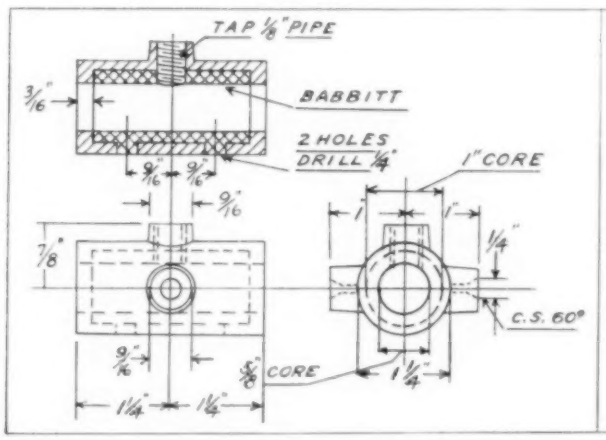
Light Weight Cars Use Alloy Cast Steel

Pressed Steel Car Co., McKees Rock, Pa., has completed an order for 100 light-weight hopper cars having 69½ tons capacity for the Bessemer & Lake Erie railroad. One of the features contributing to total weight reduction of the cars is the use of nickel alloy cast steel for truck side frames, truck bolsters, and other cast steel members. The parts are designed to have minimum physical requirements as follows: Ultimate tensile strength 90,000 pounds per square inch, yield point 60,000 pounds per square inch; reduction of area, 40 per cent; elongation in 2 inches 25 per cent.

The nickel alloy cast steel has been given the trade name Prescoloy.

Made Representative

R. G. Moeller Co., 14415 Meyers road, Detroit, has been appointed distributor of crawler shovels, cranes, draglines, and locomotive track-type cranes for the Link-Belt Co., 910 South Michigan avenue, Chicago. R. G. Moeller is president of the organization.



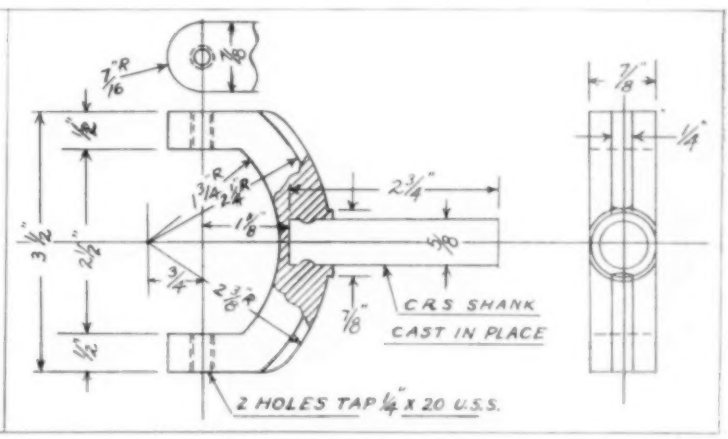


Fig. 8 (Left)—Work drawing of box with various dimensions. Fig. 9 (Right)—Similar drawing for the yoke. The short piece of steel shaft is cast in place

S. A. E. Adopts New Specifications For Gray Iron Castings

IN CONNECTION with its program of the past year in revising S.A.E. steel specifications, the Iron and Steel division of the standards committee, Society of Automotive Engineers, has devoted attention to specifications for steel castings, malleable iron castings and gray iron castings. Of particular interest are the new specifications for automotive gray iron castings.

By reason of the increasing use of heat treated steel castings, carbon and alloy, of which many types practically duplicate the compositions of S.A.E. wrought steels, the Iron and Steel division adopted as S.A.E. standard the latest approved specifications of the American Society for Testing Materials, as that society has thoroughly covered this field and its specifications for steel castings are entirely acceptable in every respect for both automotive and general users.

Specifications Discontinued

In view of the rapid and extensive advancements in the art of producing steel castings, the specification S.A.E. 1235 for medium carbon castings adopted in June, 1911, has been discontinued. For complete specifications of carbon and alloy steel castings, reference should be made to the following specifications adopted by the American Society for Testing Materials that were developed by both the producer and user interests:

Carbon Steel Castings
A. S. T. M. Spec. A27-24; A154-33T

Alloy Steel Castings (Structural)
A. S. T. M. Spec. A148-33T

Likewise, the Iron and Steel division has adopted as an S.A.E. standard specification A47-33 of the American Society for Testing Materials for malleable iron castings, in the development of which automotive interests participated.

This procedure is in conformity with the practice of the division to avoid entering fields of metallurgical standardization that are being handled efficiently by other groups, but to cooperate with such groups in the adoption of common specifications where practicable.

The new specifications for automotive gray iron castings pertain particularly to strictly automotive products, and are intended to supplement, not displace, existing gray iron specifications as developed by the American Society for Testing Materials and the American Foundrymen's association. The specifications, covering both plain and alloy cast iron, are presented in full as follows:

AUTOMOTIVE GRAY IRON CASTINGS

S. A. E. Standard

GENERAL INFORMATION

Scope—These specifications cover gray iron castings used in automotive and allied industries.

Workmanship and Finish — Castings

(*Concluded on page* 50)

Table I

Plain Cast Iron—Physical Properties and Uses

S. A. E. No.	Hardness	Transverse Strength Lbs. Min.	Transverse Deflection In. Min.	Tensile Strength Lbs. Sq. In. Min.	Uses
110	¼ in. sections; Brinell,[1] 192 max. Over ¼ in., Brinell,[1] 163 max.				Miscellaneous Soft Iron Castings
111	Brinell,[1] 163 to 207	1800	0.20	30,000	Cylinders, Flywheels, Transmission cases
112	Rockwell 'B,' 98 to 106				Piston Rings

[1] Brinell hardness tests are to be made with 10 mm. ball and 3000 kg. load

Table II

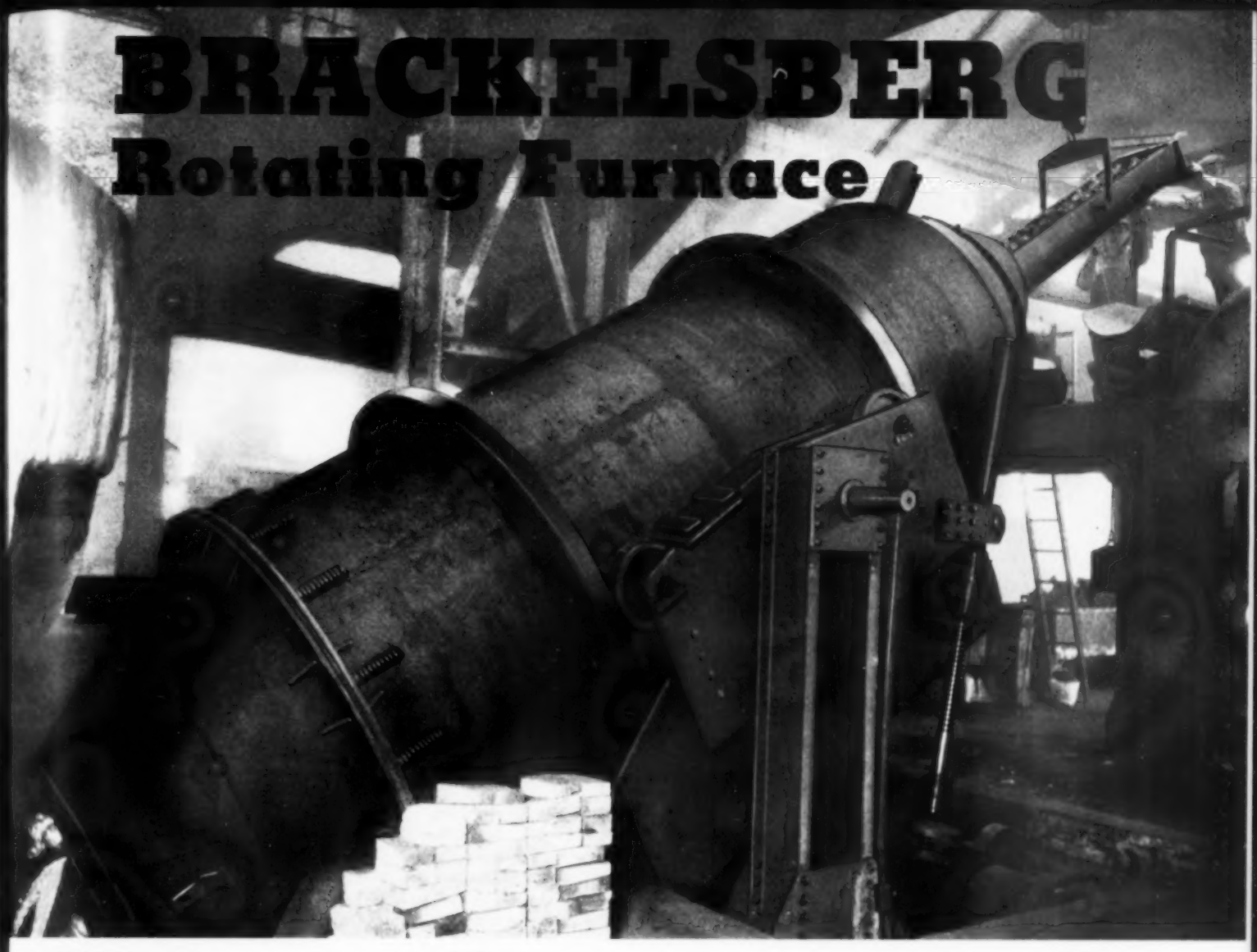
Alloy Cast Iron—Physical Properties and Uses

S. A. E.	Hardness Brinell[1] Numbers	Transverse Strength Lbs. Min.	Transverse Deflection In.	Tensile Strength Lbs. Sq. In. Min.	Uses
120	207 to 241	2200	0.20 min.	35,000	Cylinders
121	179 to 212	2700	0.27 to 0.37	40,000	Cylinders
122	217 to 248	3300	0.30 to 0.36	45,000	Clyinders
123	212 to 241	2400	0.20 to 0.30	37,500	Cylinder liners
124	187 to 228				Brake Drums, Sprockets, Clutch Plates
125	207 to 241	2500	0.24 to 0.34	37,500	
126	228 to 269			45,000	
127	187 to 228				Pistons

[1] Brinell hardness tests are to be made with 10 mm. ball and 3000 kg. load.

NOTE: For more complete information on physical properties and other characteristics, refer to the American Foundrymen's Association and American Society for Testing Materials, Symposium on Cast Iron, 1933.

BRACKELSBERG Rotating Furnace



Melts any Iron—economically

The unprecedented results obtained from the Brackelsberg Rotating Furnace (as designed and built by Whiting) during the past eight months, enable us to say with fullest confidence that this furnace is capable of producing iron of any analysis and special alloys equal in all respects to the best of present-day methods but at very much lower cost.

• ***Equal to Electric Furnace but less Expensive*** Here is a furnace that will do everything the electric furnace will do, on malleable and high test iron, and do it better and at far lower cost. It has been definitely proved on both malleable and high test irons, to be the most economical melting unit ever developed.

• ***The Answer to Present Needs*** The growing demand for greater strength and better physical properties of iron castings, stimulated by competition of other materials, has created a need for melting equipment capable of producing a wide variety of high-grade castings at reasonable cost. The Brackelsberg is the answer to that need.

• ***Perfect Control of Uniformity*** This is an outstanding advantage of the Brackelsberg. It permits close control of all elements, including carbon; and is therefore ideal for plants having a great variety of special analyses in either small or large quantities.

• ***Many Important Advantages*** The Brackelsberg offers American foundrymen a new opportunity to make high-grade castings at a profit. Its operating cost is lower than any other equipment known today.

• ***High Temperatures—3100° F. and over*** With air at room temperature, flame temperatures of 3100° F. are obtainable. By preheating the air for combustion, it is possible to get flame temperatures of any desired degree. On test runs of steel, no difficulty has been experienced in getting metal at the spout of 3100° F. and over.

• ***Recent Progress*** For the past half year a 5-ton unit has been in daily operation on malleable iron with remarkable results and lowest cost. Another large malleable foundry has just contracted for two 8-ton units. Numerous others are seriously considering installations. In Europe there are 125 rotary furnaces in operation—including steel, gray iron and malleable installations.

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WHITING

THIS IS OUR FIFTY-FIRST YEAR

(*Concluded from page 48*)

shall represent good foundry practice, shall be smooth and clean and shall be free from flaws and defects. In other respects the castings shall conform to special requirements agreed to by the supplier and purchaser.

Machinability—Castings shall machine satisfactorily.

Melting Practice — If desired, melting procedure may be specified by agreement between supplier and purchaser.

PHYSICAL PROPERTIES

Hardness Test — Hardness is to be taken on the castings on those portions specified. Hardness tests are shown in Tables I and II, physical properties. If desired, by agreement between supplier and purchaser, hardness may be specified on test bars as a means of correlation with the hardness of castings.

Transverse Tests — Transverse tests are to be made on arbitration bars according to the American Society for Testing Materials specification A-48. In case the size of bar is not specified, the 1.2-inch diameter bar shall be used. The values shown in Tables I and II, physical properties, are for the 1.2-inch diameter bar.

Tensile Tests—Tensile tests are not recommended as a part of this specification except when agreed upon by both supplier and purchaser. In general, tensile tests are for information only.

Tensile test pieces are to be machined from that portion of the casting where specified. The dimensions of the test piece will be governed by the section from which it is machined. The tensile strengths given in these specifications refer to test pieces machined from castings.

If desired, tensile test pieces may be machined from arbitration bars and tested in accordance with the American Society for Testing Materials specification A-48, by agreement between supplier and purchaser.

SUGGESTED COMPOSITIONS

Analyses—Analyses, especially in the case of combined carbon, will depend to a large extent upon the section from which the drillings are taken. In all cases the location of the chemical sample should be a matter of agreement between the supplier and purchaser.

Plain Cast Iron — The analyses in Table III are typical but are *not* to be construed as required. With good foundry practice the physical properties given should be met when the indicated analysis is used, although some variations may be necessary.

Alloy Cast Iron — The analyses in Table IV are typical but are *not* to be construed as required. With good foundry practice the physical properties given should be met when the indicated analysis is used, although some variations may be necessary.

Due to specific service requirements, costs and the variables in foundry practice that influence results and also the possible variations in combinations of the alloying constituents, the kinds and amounts of the alloying elements used should be a matter of agreement between the supplier and purchaser for specific classes of castings.

In general, one or more of the elements chromium, copper, molybdenum and nickel should be used.

Group Incorporates

Foundry Equipment Manufacturers' association, 1213 West Third street, Cleveland, has been incorporated on the basis of a corporation not for profit, according to a recent announcement of Arthur J. Tuscany, executive secretary.

Officers of the Foundry Equipment Manufacturers' association, Inc. are as follows: President, F. R. Wallace, Tabor Mfg. Co., Philadelphia; vice president, R. S. Hammond, Whiting Corp., Harvey, Ill.; executive secretary and treasurer, Arthur J. Tuscany, Cleveland.

Elect Code Members

Ornamental iron, bronze, wire and steel specialty manufacturers, at a meeting in Columbus, O., elected the following men to serve on the code authority for the industry: William A. Boesche, Ornamental Iron Works Co., Akron; and John Coulton, W. S. Tyler Co., Cleveland. The following were elected to serve as regional code authorities: Bronze, H. B. Harsh, John Harsh Bronze & Foundry Co., Cleveland; wirework, F. J. McCarty, Federal Iron Works, Akron; ironwork, C. F. Reiling Reiling Mfg. Co., Pittsburgh; metal specialties, S. S. Sheffield, Cincinnati Mfg. Co., Cincinnati.

Book Review

Metal Statistics, cloth, 560 pages, published by American Metal Market, New York; supplied by THE FOUNDRY, Cleveland, for $2, plus 15 cents for postage; in Europe by Penton Publishing Co. Ltd., London.

The twenty-eighth annual issue of this publication is uniform with previous issues in form and treatment, covering production, consumption, imports, exports, stock prices and other information on ferrous and nonferrous products and raw materials.

A series of tables expanded from previous issues covers various economic subjects, foreign commerce, industrial production building, railways, car loadings, automobiles, commodity indices, domestic and foreign money rates and other matters.

Table III

Plain Cast Iron—Chemical Compositions

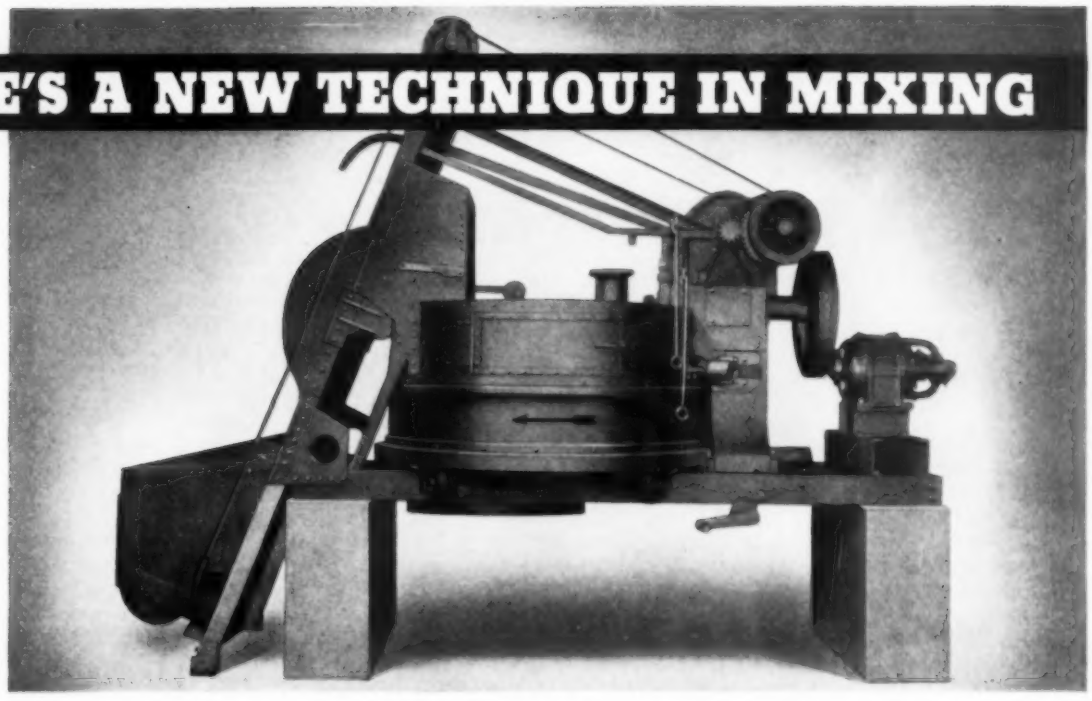
S. A. E. No.	Total Carbon ±0.15	Combined Carbon ±0.15	Manganese ±0.10	Phosphorus	Sulphur Max.	Silicon ±0.10	Uses
110	3.45		0.60	0.30 max.	0.13	2.50	Miscellaneous Soft Iron Castings
111	3.25	0.45	0.60	0.20 max.	0.13	2.20	Cylinders, Flywheels, Transmission cases
112	3.45		0.60	0.60±0.15	0.10	2.90	Piston Rings

Table IV

Alloy Cast Iron—Chemical Compositions

S. A. E. No.	Total Carbon ±0.15	Combined Carbon ±0.10	Manganese ±0.10	Phosphorus Max.	Sulphur Max.	Silicon ±0.10	Uses
120	3.25	0.65	0.60	0.20	0.12	2.25	Cylinders
121	3.25	0.60	0.70	0.20	0.12	2.35	Cylinders
122	3.00	0.65	0.75	0.15	0.12	2.05	Cylinders
123	3.25	0.83	0.65	0.20	0.12	2.00	Cylinderliners
124	3.15	0.50	0.60	0.20	0.12	2.00	Brake Drums, Sprockets, Clutch Plates
125	3.25	0.65	0.60	0.20	0.12	2.00	
126	2.80	0.60	0.50	0.20	0.12	2.30	
127	3.40	0.40	0.60	0.20	0.12	2.30	Pistons

THERE'S A NEW TECHNIQUE IN MIXING



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. . . a quick and thorough blending of all materials—saves time and power—seven sizes, open and closed types.

IN the Lancaster—foundrymen have found a new mixing technique proven in service that cuts mixing time—lowers mixing costs. The pan, revolving clockwise, carries the materials to the mixing area, where an assembly of plows and mullers whirling rapidly in counter direction provides a positive mixing action. The materials are passed outward—are then turned with side plows and scrapers and carried back to the mixing assembly by the revolving pan in a continuous cycle.

Quick—Thorough Mix

In a Lancaster "dead spots" are eliminated. All parts of the batch are subjected to a thorough and positive mixing action with every revolution of the pan. The mullers ride the material. They impart a mulling—not a grinding action, break up the lumps. A light, well aerated mix results. Mixing time is cut 25, even 50%. Less power is required. Greater tonnage can be handled on the same or fewer machines.

Highly Efficient

Lancaster mixers have demonstrated their efficiency for mixing core sand, facing sands and backing sands. The necessity of overloading the batch with excessive amounts of core oil, or other binders, to insure dispersement of the material to all parts of the batch. is eliminated in Lancaster mixing. Substantial savings in materials can be made. Higher percentages of old sand can be used with satisfactory results. Production sizes include those of ⅔, 1¾, 5, 9, 14, 18 and 36 cubic foot capacity. Open and closed—hand, chute and hopper fed models are available. Full details on request. For descriptive folder, write:

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6201 HARVARD AVENUE CLEVELAND, OHIO
In New York—30 Church St. *In Chicago*—First National Bank Bldg.

BARTLETT-SNOW
Lancaster Mixers

Method Depends on Many Factors

Choice of pattern equipment usually hinges on number of castings on order

PRACTICALLY every day the general jobbing foundryman is faced with the problem of deciding on the best method to adopt in the production of certain castings. On long running orders the cost of elaborate pattern and flask equipment is absorbed gradually. For shorter orders the foundryman has to compromise and adopt a method reasonably satisfactory from both the production and economic angles. For example consider a tapered cast iron base, 2 feet high, 15 x 17 inches inside at the large end and with a 3-inch wide flange around the same end. The metal thickness is ¾-inch and the estimated weight approximately 400 pounds. The order is for 200 castings and the foundryman has the option of making the casting in one piece or split in two vertically through the center.

The best method for making these castings depends to a considerable extent on the molding equipment at present in the shop, including the supply of flasks. The time of delivery also is a factor. A plain wood pattern, either split or whole, would serve satisfactorily where the sand is rammed by hand and where the entire lot of castings is not wanted in a hurry. If several men are available, two, three or more patterns might be provided. If the foundryman intends to use jolt and squeeze machines or a sandslinger, metal patterns will be needed, although in a pinch a solidly constructed wood pattern would serve for such a comparatively short order.

Under one set of conditions the one piece casting could be produced more cheaply than the two-piece casting. Under another set of conditions the reverse might be true. The amount of sand to be handled is almost the same whether the casting is made in one or two pieces. Thus a flask 27 x 33 inches, 4-inch drag, 18-inch cope for the half casting would hold approximately 11¼ cubic feet of sand, or 22½ cubic feet for the two half castings. A flask 33 x 33 inches, 3-inch drag, 24-inch cheek and 6-inch cope for the one piece casting would contain 22.8 cubic feet of rammed molding sand.

One advantage of the one piece casting is that the number of lifts in the foundry are reduced. Also the time required to assemble the two-piece casting is eliminated. If the sand is rammed with a sandslinger, or if the molding machines are strong enough to handle the load, the one piece casting can be made more economically and rapidly than the two piece casting. Assuming that the foundry is equipped to handle either a one piece or two piece casting the following alternative methods are submitted for consideration. Manifestly without a knowledge of all local conditions no person is in a position to submit an estimate of the cost of the equipment.

For the split casting:

1—Two pattern boards with solidly braced pattern on one for the cope and corresponding depression on the other for the drag.

2—One-piece metal match plate, cope impression on one side, drag impression on the other. Make required number of drags per day on one side, then turn the plate over and make the copes.

3—Two single side match plates for use on two machines.

For the one-piece casting:

1—One pattern board with flange pattern on one side and strongly braced corebox on the other side. Drag and core are made on this board. One pattern board with pattern for the outside of the casting and allowance in length for a stripping plate. Cheek and cope rammed as one piece on this. No bars needed in cope.

2—Same as No. 2 with the exception that corebox section is omitted from drag pattern board. Core is made in separate box and placed on drag after drag is rolled over. (a) Core may be lifted from box, or, (b) corebox containing core may be placed on drag by suitable guides. (c) Empty corebox, either hinged or plain may be placed on drag and core rammed in place.

3—Metal duplicates of wood patterns.

The recommended gating system for split casting is a finger gate or half a dozen small pop gates over the center with a whistler on top of the flange.

The one piece casting is best run through a central sprue and two horizontal gates ¼ x 3 inches about 12 inches from the bottom. The flat piece of steel for making the gate extends through a slot in the sprue member aud through slots in opposite sides of the corebox, or to be more accurate, that part of the pattern which serves as a corebox. A 6-inch bushing, round, square or oval and 8 or 10 inches in length incorporated in the core will prevent the sprue from splitting the sand. To prevent possible distortion or the danger of the gates cracking the casting, it may be advisable to point the gates at a tangent instead of at right angles.

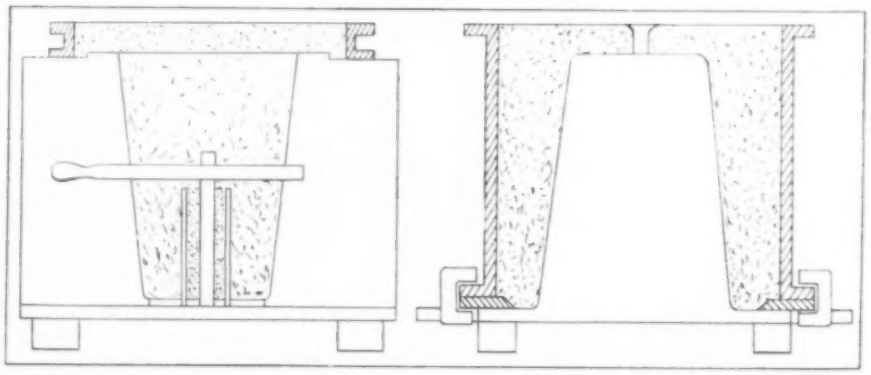

Fig. 1 (Left)—Pattern rigging for drag, core and gates. Fig. 2 (Right)—Lifting plate on bottom of cheek may be clamped, bolted or cast on as part of flask

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Northeastern Ohio Chapter Holds Meeting

Second meeting of the newly formed Northeastern Ohio chapter of the A. F. A. was held at the Cleveland club, Cleveland, April 25, with Walton L. Woody, foundry manager, National Malleable & Steel Castings Co., Cleveland, and chairman of the local chapter, presiding. Reports of the program committee indicated that plans for next year's technical program are well under way. It was announced that the regular meetings of the chapter will be held on the third Thursday of each month, except June, July, August and December.

Elmer Zirzow, chief chemist, Cleveland works, National Malleable & Steel Casting Co., presented a short talk on "Practical Application of Modern Sand Testing Methods to Foundry Problems". Mr. Zirzow discussed the practice followed in his plant in preparing sand and in testing for certain factors such as bond strength, permeability, and grain size and shape. Mr. Zirzow also discussed the use of sea coal in foundry sand.

Pat Dwyer, engineering editor, THE FOUNDRY, presented an interesting illustrated talk on "Gates and Risers for Castings". Mr. Dwyer illustrated with slides, certain basic types of gates, and then showed a variety of applications and developments of gates to special problems.

The next meeting of the group will be held at the Cleveland club, May 16, and will be addressed by S. C. Black, works manager, Willys-Overland Co., Toledo, O., on "The Operating Budget and Its Relation to Superintendents and Foremen".

French Association Elects Officers

Emile Ramas was elected president of the Association Technique de Fonderie, of Paris, at the annual general meeting held on March 21. Mr. Ramas was president of the association from 1918 to 1926, and since then has been honorary president. He is the managing director of Societe Francaise Metallurgique "Griffin" and professor at the high school of foundry in Paris.

Maurice Werts, of Fonderies "Les Fils de A. Werts," was elected first vice president, the other vice presidents elected being: Achille Brizon, managing director of Societe Annonyme des Fonderies A. Brizon, who attended the international foundry congress in Philadelphia last year; Eugene Dady, president of the Association Amicale et Mutuelle de Fonderie; Charles Koehler, general secretary of the Syndicat General des Fondeurs de France, and managing director of Societe Anonyme des Fonderies de Saint-Ouen; Jean Lobstein, managing director of Usines Lobstein, and president of the Syndicat des Fondeurs en Fer de la Region Parisienne; Leon Montupet, managing director of Fonderies Montupet; Henri Strube, foundry proprietor and president of the Chambre Syndicale des Fondeurs en Cuivre et Bronze.

The following countries are represented on the council of the Association Technique de Fonderie, and each representative was elected a vice president of the association: Belgium: Joseph Leonard, president of the Association Technique de Fonderie de Belgique, and manager of Societe Angleur-Athus, Grivegnee; Italy: Federico Jarach, president of Federazione Nazionale Fascista del l'Industria e Metallurgica, Milan; Luxemburg: Leon Brasseur, engineer at Luxemburg; Spain: Juan-Manuel Espana, consulting engineer and honorary commercial attache for Spain in Paris.

Roger R. Meyer, director of Societe de Produits Metallurgiques, was re-elected general secretary, and Albert Lardin, treasurer.

Considers Gray Iron At Philadelphia Meeting

W. G. Reichert, metallurgist, Singer Mfg. Co., Elizabethport, N. J., addressed the members of the Philadelphia Foundrymen's association at a meeting held April 10 at the Engineers club, Philadelphia, on "Manufacture of Gray Iron Castings." Mr. Reichert discussed various engineering properties of gray iron, featuring particularly tensile strength, machinability, wear, corrosion and heat resistance.

The speaker devoted considerable time to a discussion of foundry sands, and the part which proper sand control plays in the production of good castings. Mr. Reichert closed his talk with a brief discussion of the dust problem in the castings industry.

C. Walter Yost, Reading Iron Co., Reading, Pa., and president of the association, reported on the progress which has been made toward the proposed affiliation of the Philadelphia group with the American Foundrymen's association. Earl S. Sparks, secretary-treasurer of the association, read the names of a considerable number of members who already have given written approval of the affiliation.

Brief talks were made by Oliver Smalley, Meehanite Metal Corp., Pittsburgh, and Frank G. Steinebach, managing editor, THE FOUNDRY, Cleveland.

Moves New York Office

New York offices of both the crane and tramrail divisions of the Cleveland Crane & Engineering Co., have been moved from 50 Church street to 60 East Forty-second street.

Chicago Section Discusses Legislation

Pending legislation in Illinois affecting foundries of that state was discussed at the monthly meeting of the Chicago section, American Foundrymen's association, April 4. About 90 members of the section attended the meeting.

Discussion of proposed bills introduced at the Illinois capitol was presented by J. R. Allen, International Harvester Co., Chicago. Among proposed bills introduced but not yet passed are a 30-hour week bill; a bill providing for increases in workmen's compensation rates which would include occupational diseases; a bill to set up a state insurance compensation agency which would supplant private companies; and anti-injunction bill which would enjoin courts from issuing injunctions against labor; a bill to limit liability of labor union executives; old age pension and employment insurance bills; and a bill providing for a new blower law.

The proposed changes in the blower law would eliminate inconsistencies in the one now in effect, which has become outmoded. Mr. Allen also described the new act covering occupational diseases which has been introduced. This bill has received favorable mention in several other states which have patterned their bills after the one prepared for Illinois. The bill was designed to protect the employer from the silicosis racket as well as to give ample protection to workers exposed to dusty conditions.

J. S. Vanick, International Nickel Co., New York, will describe various methods of hardening cast iron at the meeting of the Chicago section to be held on June 6.

Connecticut Group Hears Talk on Steels

Dr. Robert M. Brick, metallurgical department, Yale university, New Haven, Conn., was the principal speaker at the regular meeting of the Connecticut Foundrymen's association held Friday, April 12, at the Home club, Meriden, Conn.

In discussing and illustrating the heat treatment of plain carbon and alloy steel, Dr. Brick explained in considerable detail the equilibrium diagram, illustrated the growth of crystal grains, and touched upon the structural components of steel, namely, graphite, pearlite, ferrite and steadite.

W. J. Maton, Waterbury-Farrel Foundry & Machine Co., Waterbury, and president of the association, presided. Frank G. Steinebach, managing editor, THE FOUNDRY, Cleveland, spoke briefly on the recent organization of the Northeastern Ohio chapter of the American Foundrymen's association.

European Foundry Practice

Digest of recent literature covering various phases of castings manufacture

Making Iron Rolls

Cast Steel Rolls—Their Manufacture—Their Defects, (Les Cylindres de Laminoirs en Acier Coule—Leur Fabrication—Leurs Defauts), by M. L. Quincy. *Revue de Metallurgie*, Paris, January, 1935.

Principal defects and their remedies are covered in this first article. Blow-holes are due to the escape of gases through metal that is not sufficiently fluid. Often they are grouped together, and cause rejection when they appear during machining.

Scabs, due to the erosion of the sand of the mold through various causes, also are possible causes of rejection. Inclusions, usually slag, can be imprisoned in the rolls, often near the pinions, if the metal is not sufficiently fluid or if the feeder is not large enough.

These various defects largely can be avoided by careful practice and control of operation. Air vents should be placed properly in the molds, bottom pouring can be effected tangentially, the metal should be fluid, and runners can be lined with refractory material to prevent erosion.

Piping is an important defect which it is practically impossible to avoid completely. A theory is developed which explains the formation and shape of piping due to the difference of density between the solid and liquid metal, combined with gravity. To prevent piping from being located in the actual roll, or in the neck, a substantial feeder is necessary, but for economic reasons it cannot exceed a certain size which may be readily determined.

Even with the use of feeders, the piping may continue into the neck or the roll. The author has experimented with various shapes of feeders without satisfactory results: the only two cases where no piping showed in the rolls necessitated the use of too large a feeder. Actually, a portion of piping of small diameter located in the center of the neck, or even of the roll, should not be considered a cause of rejection. The suggestion of pouring rolls horizontally has been made, but must be rejected, because piping still occurs and then shows on the barrel, and because that method of pouring causes other important defects in the casting.

There are various means of at least reducing the importance of piping. Such artificial methods as slow top-pouring with relatively cold metal, using a cylindrical chill in the axis of the mold, using a central core, or pouring in two operations, first the lower neck and the barrel, and then, after allowing the metal to settle, the upper neck, are not recommended by the author for the production of rolls.

The normal methods are: Very slow pouring through the feeder, replenishment of the feeder head, agitating with a steel rod, and electric reheating. These methods are based on the common principle of maintaining hot liquid metal in contact with the solidifying zone. It has been found that one third of the piping is effected during one thirteenth of the total period of solidification, and it is of interest to conduct the final period of pouring as slowly as possible.

Practically, a current method is to effect bottom-pouring until the metal arrives just above the upper neck, and then turn to top-pouring to feed the head, and as slowly as the temperature of the metal in the ladle will allow, during the latter period the drawbacks of top-pouring are of no importance.

In any case, the last cubic inches of the pipe are very difficult to fill; feeding can be made more effective by the use of chemical compounds thrown on the liquid metal in the feeder to keep it as hot as possible; even ordinary charcoal can be used to that effect without unsatisfactory results, since at that stage any recarburization will not reach the roll. Agitation of a steel rod about 1-inch in diameter also helps the liquid metal to enter the pipe and tends to throw up slag at the surface of the metal.

The feeder can be heated by a small auxiliary electric arc furnace, and this method enables a marked reduction in the size of the feeder. Such heating, however, is only effective up to a point, and will have no effect on the metal that has actually solidified beneath the feeder-head.

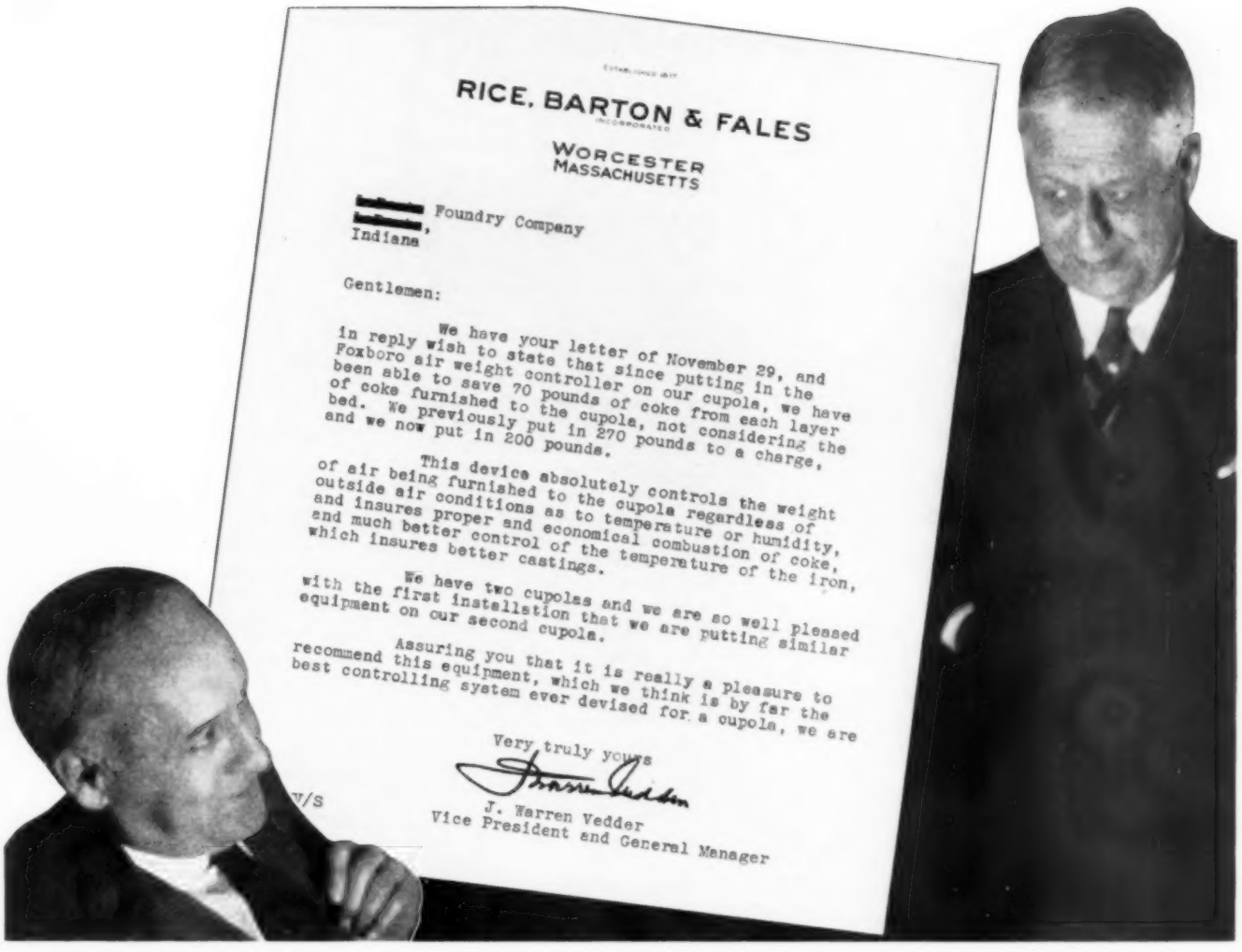
The author emphasizes the fact that no method will completely eliminate piping, and again stresses the point that a void or small diameter located centrally in the upper part of the roll has no detrimental effect if the roll is otherwise sound.

Growth Resistance

Investigation Upon the Influence of Additions of a High-carbon Special Pig-iron on the Growth and Scaling Resistance of Gray Iron (Versuch ueber den Einfluss von Zusaetzen eines hochgekohlten Spezialroheisens auf die Wachtums-und Zunderbestaendigkeit von Grauguss), *Die Giesserei*, Duesseldorf, Germany, Nov. 9, 1934.

The special high carbon pig iron mentioned contains from 4.50 to 5.00 per cent carbon; 0.20 to 0.50 per cent silicon; 0.30 to 0.70 per cent manganese; 0.08 to 0.15 per cent phosphorus; 0.01 to 0.03 per cent sulphur and about 0.40 per cent titanium. It is made by a process using large quantities of high alumina slag. In the investigation amounts ranging from 20 to 80 per cent of that special iron were added to mixtures containing scrap iron, steel scrap, other pig irons, ferroalloys etc., in differing quantities, forming 10 different mixes.

Test bars cast from the mixtures were subjected to tests in the dilatometer and muffle furnace to determine the effect of elevated temperatures. Curves, charts and photographs are included with the text matter to bear out the conclusions made that additions of the special pig iron increase the resistance to growth and scaling; the increase being greater with the increase of the pig iron added to the mixture.



RICE, BARTON & FALES
INCORPORATED
WORCESTER
MASSACHUSETTS

[redacted] Foundry Company
Indiana

Gentlemen:

We have your letter of November 29, and in reply wish to state that since putting in the Foxboro air weight controller on our cupola, we have been able to save 70 pounds of coke from each layer of coke furnished to the cupola, not considering the bed. We previously put in 270 pounds to a charge, and we now put in 200 pounds.

This device absolutely controls the weight of air being furnished to the cupola regardless of outside air conditions as to temperature or humidity, and insures proper and economical combustion of coke, and much better control of the temperature of the iron, which insures better castings.

We have two cupolas and we are so well pleased with the first installation that we are putting similar equipment on our second cupola.

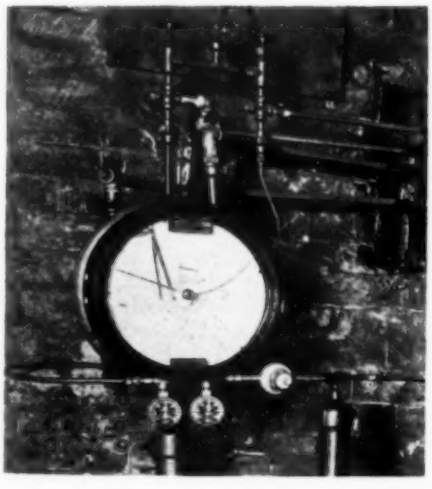
Assuring you that it is really a pleasure to recommend this equipment, which we think is by far the best controlling system ever devised for a cupola, we are

Very truly yours

J. Warren Vedder
Vice President and General Manager

V/S

One Foundryman Tells Another!



One well-known foundry was "from Missouri." An investigation of the Foxboro Cupola Air Weight Controller had indicated that it would improve the quality of their castings, reduce coke and save power. But, for a final proof, they wrote to five other foundries where these Foxboro Controllers were in use—including several great automobile foundries.

Above is reproduced one of the replies received. It is typical of the other letters; every user was wholeheartedly enthusiastic—all recommended the use of the Foxboro Air Weight Controller.

Why postpone longer the direct savings and the immediate improvement in casting uniformity that *you* can get with this Control. Remember—it is not expensive, can be used with your present blower equipment, is simple, easy to install and easy to operate. If you do not have Folder 610—or if there is any further information you need—write us. No obligation.

The Foxboro Company, Foxboro, Mass., U.S.A.
Branches in Principal Cities

CONTROL OF CORE-OVEN
TEMPERATURE CONTROL
OF PICKLING TANKS

FOXBORO
REG. U. S. PAT. OFF.

INDICATING, RECORDING
AND CONTROLLING
PYROMETERS, THERMOMETERS
FLOW METERS AND GAUGES

CUPOLA AIR WEIGHT CONTROLLER

Extends Apprenticeship Training

(*Concluded from page 20*)

shop and machine shop who had not had sufficient opportunity to get a rounded training in their respective trades, due to the depression and the low rate of plant operation. These men were placed in the same training course offered the apprentices. They were continued at the same rate of pay they were receiving on their various jobs in the plant. To make an equitable adjustment in the wages of some of the older employes taking the course, the management decided that these foundry apprentices who had been employed by the company for a period in excess of four years would receive 64 cents an hour for the time spent in the apprenticeship class room. While working in the plant the young man receives the same hourly rate as before entering the apprentice course. That rate of 64 cents an hour applies only to the apprentices who would receive that rate or a higher rate. All other apprentices are paid the actual rate of pay, whether it be less or more than 64 cents an hour, until they have been connected with the company for a period of four years.

Measure Period in Hours

Recently the management has undertaken to provide complete records of the actual number of hours which the boy works in the plant. This was done, because it is realized by those in charge that under the reduced operating conditions which have prevailed during the past few years, it is impossible to measure the opportunity for development offered the boy merely in terms of years. When operations again approach normal, the situation will be changed and it will be possible for the boy to be trained in a wide variety of work during four years. However, during the entire period of restricted operations, rates of pay are being continued on a six-months basis simply for the sake of encouraging the members of the class.

When the present instructional plan was inaugurated, the management received a number of requests for participation in the training program, from some of the molders and coremakers, who previously had finished an apprenticeship course with the company, but who wanted to obtain further instruction in various phases of foundry practice, as provided in the instructional course adopted by the company. These men subscribe for the course at their own expense, and in return the management has arranged for the foundry apprenticeship instructor to set aside a period during the time he visits the plant, for consultation, questions, and special assistance whereever possible with that particular group of men. Consultation takes place during the noon hour, or after the work in the afternoon.

Several of these graduate apprentices are taking advanced studies covering special subjects. One course, for example, contains the following subjects: Pattern equipment and operation, patternmaking materials, pattern requirements, general patterns, pipe and valve patterns, gear calculations, wheel and propeller patterns, cylinder and frame patterns, special patterns and storage, general appliances and processes, formulas, mechanical principles, green sand molding, coremaking, machine molding, dry sand molding, loam molding, foundry equipment, elementary chemistry, metallurgy of iron and steel, metallurgy of nonferrous metals, cupola practice, mixing cast iron, malleable castings, elements of blue print reading, hardening and tempering, heat treatment of low carbon steel, foundry chemistry, iron and steel melting furnaces, steel castings. Other graduates are studying mechanical drawing and the reading of blueprints.

While all of the details of the apprenticeship course have not been completed, it is the plan of the management to arrange the plant training work so that each boy has a chance to work for short periods in the other departments of the plant including engineering, patternshop, machine shop and foundry. One group now is receiving a broader viewpoint of plant problems through this method of working in other departments. The management anticipates that the groups in foundry, patternshop and machine shop practice will work in each of the four departments previously mentioned for approximately 250 hours. It also is the practice to rotate the apprentices on different jobs in the foundry, this coming directly under the supervision of the molding foreman.

In the apprentice course, the management prefers to start boys who are about 18 years of age, although exceptions are made where the candidate for admission to the course looks promising. Preference also is given to boys with a high school education, although this feature naturally must be governed by the law of supply and demand. At present a total of 30 are taking the apprenticeship course. This includes three molders' apprentices, four coremaking apprentices, one pattern apprentice, and 12 machine shop apprentices. In addition seven apprentice graduates in the machine shop and three in the foundry are taking the course and are given aid by the instructor provided by the company.

Upon the completion of the course, the management of the company explains to the graduate that it does not consider him a journeyman molder in the sense that he has a complete and well-rounded knowledge of the art of molding. However, it is pointed out that it is up to the young man to prove that he has the ability to acquire the necessary knowledge and skill which will in time make him a first class molder. Some years ago, when work was plentiful, a few of the boys completing the course were smitten with a wanderlust, and secured employment at other shops in Ansonia and vicinity. In most instances, these boys returned to the Farrel-Birmingham Co. in a year or so. At present, all of the boys remain with the company after completing the course, due in part to the fact that jobs have been so difficult to find.

As business continues to improve, the management of the Farrel-Birmingham Co. expects to undertake the few remaining details of the apprenticeship course, which as yet have not been considered possible. Results of the first six months' operation of the plan have been extremely satisfactory from every standpoint, including interest and progress in all phases of the course. Therefore the management believes that the present program will continue to supply trained young men for the different plant departments, as was the case with the course employed for over 13 years. Furthermore, it is believed that the boys completing the present apprenticeship program will have a broader knowledge of many important studies of exceptional value to the foundryman.

Gray Iron Featured In Meeting at Rockford

H. Bornstein, director of research and testing, Deere & Co., Moline, Ill., addressed the regular meeting of the Northern Illinois Foundrymen's association, held at the Elks club, Rockford, Ill., on April 9. Mr. Bornstein spoke on "Alloys and High Strength Cast Iron".

The speaker began the discussion by dealing with the various melting methods, and then followed with the consideration of elements commonly occurring in cast iron. Alloys, such as nickel, chromium and molybdenum were discussed and their effects on the structure of cast iron were described. Mr. Bornstein also gave considerable information on the use of copper in cast iron. The discussion of heat treatment included a mention of aging.

YOU CAN'T AFFORD NOT To Clean Your Factory Glass!

THERE is an enormous bill being paid by American Industry for dirty factory glass. Daylight is free. Artificial light must be paid for — each month.

When you consider that your glass can be cleaned for less than ¼c per square foot (material and labor) you can readily see that dirty glass can cost your company more than this *every single month.*

Skybryte has for 20 years been the recognized standard of factory glass cleaners, yet it costs less than the inferior substitutes being offered. Skybryte is guaranteed to do the work. There is no rubbing or scrubbing. Simply brush it onto the glass and flush off with water. The glass is *clean* and the daylight candle-power in your plant is increased from *10 to 20 times.*

Try SKYBRYTE At Our Risk

Let us ship you 5 gallons of Skybryte and try it on your glass. Five-gallon price $1.50 per gallon, one brush free. Barrel price 90c per gallon, four brushes free. All prices F. O. B. Cleveland. If you are not entirely satisfied with results, ship it back at our expense and your money will be promptly refunded.

New Low Barrel Price

Skybryte CLEANER (LIQUID)

90c per Gallon

Furnace Melts One Half Ton

(*Concluded from page* 22)

is possible to operate the furnace under pressure, at atmospheric pressure or under a partial vacuum to suit the conditions necessary for the type of material to be melted.

The burners consist of pipes and fittings having a 3/32-inch orifice with an equal sized air opening. Needle valves for the oil and air are provided but the oil is permitted an unrestricted flow while the air volume is controlled. Atomizing air is maintained at 45 pounds pressure by a regulating valve and the oil is supplied at 25 pounds pressure.

Crank case drainings from automobiles constitute a satisfactory and economical source of fuel. However, the use of that material necessitates treatment with a light oil to permit extraction of inert particles and subsequent blending with tar to increase the heating value.

Owing to the presence of inert and undissolved greases it is necessary to subject that material to a treatment with a light oil or heat and subsequent filtering or straining. Further blending with tar is necessary to increase the heating value.

For steel practice a fuel ranging from 25 to 30 degrees Baume works satisfactorily. For cast irons a lighter fuel may be used if desired. The operating pressures previously given are for a 30 degree oil. Under these conditions the oil consumption is approximately 10 gallons per hour.

The maximum capacity of this open-hearth furnace installation is about 1000 pounds of steel while heats of 100 pounds capacity may be made with success. Cast iron heats as small as 50 pounds may be melted with comparative ease. A 300-pound heat of steel requires from 1½ to 3 hours from charge to tap, depending upon the specifications, and a similar sized heat of cast iron may be tapped in 45 minutes or less. The time required for heating the checkers preparatory to melting, starting from a cold furnace, is approximately three hours.

Manipulation of heats is accomplished the same as in larger units. The bottom may be either rammed or *burned in*. This type of furnace provides a number of distinct advantages, such as close control of analyses; ease of operation; flexibility; rapidity of melting and above all economy of operation. Practically any type of alloy steel may be manufactured with attendant economies. The unit is suited to the manufacturing of alloy irons, since it may be used in conjunction with a cupola for duplexing or it may be used to melt from the cold state and for superheating. Alloying is accomplished readily since the heat may be held until diffusion is complete and due to the fact that the atmosphere may be controlled readily. Oxidizable elements may be introduced with minimum losses. The power cost of

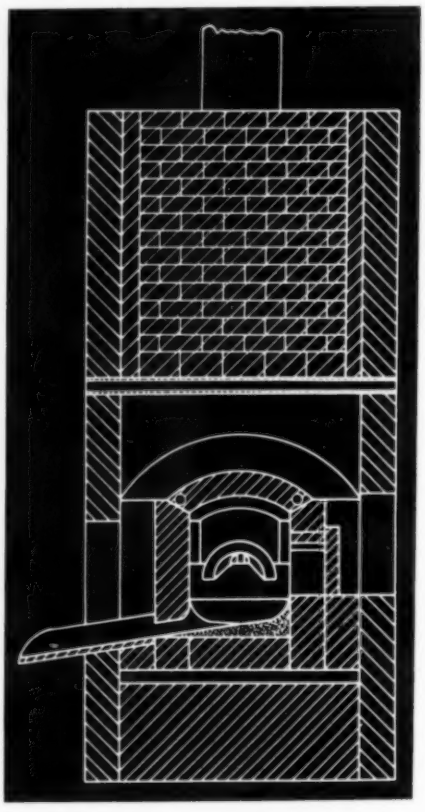


Fig. 3—Construction shown by transverse section through the center

the installation is exceedingly low since both the blower and compressor are driven by a six cylinder gasoline engine which utilizes natural gas as a fuel. The fuel cost is from 6 to 7 cents per hour.

Book Review

Practical Metallography (Praktische Metallkunde), by George Sachs, fabrikoid, 272 pages, 6½ x 9¾ inches, published by Julius Springer, Berlin, Germany, and supplied by THE FOUNDRY, Cleveland, and in Europe by the Penton Publishing Co., Ltd., London.

Readers of German will be interested in this volume which is the first part of a series on the practical metallography of nonferrous metals and alloys dealing with melting and pouring; molding, and heat treatment. This first part treats only melting and pouring of casting, and is divided into three main sections covering general phenomenon of melting and solidification, ingot castings, and molded castings. The first section on melting and solidification describes in detail such subjects as principles of solidification, structure of metals and alloys, gases and metals, influence of minute impurities, and heat treatment of castings.

Section two on ingot castings discusses chills, horizontal and vertical casting, chill casting for special purposes, cooled ingot molds, elimination of piping, cracks in cast ingots, casting structure and properties, pouring of copper, and centrifugal casting. The third section on molded castings describes the various methods of molding, casting or pouring properties of casting alloys, cracks and strains, casting conditions and strength, physical testing of cast alloys, special properties of cast alloys, and testing and properties of cast specimens. An appendix gives the properties of the most important elements, and 5 tables are included which present constitution diagrams of a number of nonferrous alloys.

Quad City Association Nominates Officers

Clyde H. Burgston, Deere & Co., Moline, Ill., and president of the Quad-City Foundrymen's association, announced at a meeting held in Rock Island, Ill., April 15, that the May meeting of the group will be devoted to the organization of a chapter of the American Foundrymen's association. The announcement also was made that several national officers have been invited to attend that meeting.

H. Bornstein, Deere & Co., Moline, reported for the organization committee for the local chapter of the A.F.A., and the following officers were nominated: President, A. E. Hageboeck, Frank Foundries Corp., Moline; vice president, Tom A. Frank, Frank Foundries Corp., Davenport, Iowa; secretary-treasurer, J. Morgan Johnson, Tri-City Manufacturers' association, Moline, Ill.; directors, John H. Ploehn, C. F. Scherer, M. J. Gregory, H. F. Henninger, Clyde Burgston and E. W. Gullberg.

Mr. Bornstein also praised the work in the local association of Garnet Phillips, Frank Foundries Corp., Moline, who has resigned to become metallurgist, International Harvester Co., Chicago.

The address of the evening was presented by Ed. Mever, general foundry superintendent, Chain Belt Co., Milwaukee, who spoke on "Malleable Castings." The speaker presented an interesting picture of the industry, starting with the raw materials and carrying through to the completed product. He described several processes used in melting and mixing malleable iron, and discussed the various types of fuels used. Information also was presented on molding, coremaking, gates, coring and annealing.

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Properties of Malleable Cast Iron

(*Concluded from page* 23)

standpoint the other materials offer no particular advantages. The ductility of malleable being over 15 per cent in most cases is adequate to provide sufficient toughness to withstand blows and road shocks, without sudden failure.

From a cost standpoint the malleable casting is probably slightly cheaper. From the standpoint of adaptability to design, malleable iron probably is somewhat more flexible than the other materials. The stamping would have the disadvantage of requiring assembly and also would necessitate uniform sections at all points. However, the big saving to the manufacturer is in the cost of machining. Malleable iron can be machined at higher rates of speed than any other ferrous metal, with the possible exception of fully annealed cast iron. There is a saving not only in the cost of machining each individual hub but also fewer machine tools are required to reach a definite production. As a result, a malleable iron hub is the cheapest hub which will fill the engineering requirements of such a part.

Finds Many Applications

Other applications of malleable on automotive vehicles are pedals, spring brackets, differential carriers and cases, various brake parts, and numerous brackets, levers, and supports throughout the chassis and motor.

Automotive engineers are thoroughly conversant with the properties, limitations, and design of malleable castings, and the use of malleable on automobiles has expanded steadily in the past few years, in spite of inroads from stampings, forgings, and die castings, where such materials are better suited.

Malleable iron finds many uses in the railroad field. Here, the machinability of malleable iron is of practically no consequence. What is wanted is a low cost, strong, tough material. For many light parts, of which box car door fittings are typical, production quantities are usually so small that forgings are at a cost disadvantage because of cost of dies. Malleable is suited ideally for this purpose. On heavier castings, such as running gear parts, malleable is in most cases an optional material with cast steel and whichever material has the lowest market price at the time usually is selected for the parts. Uses for malleable castings in the railroad field include side bearings, journal boxes, center plates, brake heads, column guides, brake beam brackets, draft gear parts, draft lugs, and coupler carriers.

Malleable iron is used extensively in railroad work because of its excellent corrosion resistance. This is due to the graphite content in the malleable iron which tends to inhibit the penetration of rust.

In the agricultural field, malleable iron is used extensively for the reason that agricultural implements are badly abused. Most operating parts are not machined and smooth surfaces are necessary. The metal must be tough to withstand shocks encountered in service and the metal must be rust resisting to withstand the exposure to which nearly all agricultural implements are subjected.

Of more interest in many cases are the miscellaneous applications, such for example, as lawn mower gears, washing machine parts, hardware items, conveyor chains, tool parts, pipe fittings, bolt anchors for cement construction, railing panels for bridges, industrial fence fittings, manhole covers, small machine tool parts, barrel plugs, electrical outlet boxes, cable clamps, insulator supports, school desk frames, packing house machinery, sewing machine parts, and literally thousands of other applications too numerous to mention.

Improvement made in the elimination of shrinks and primary graphite in the last 10 years has been of as much benefit in expanding the market for malleable, as the steady improvement in tensile strength and elongation, which has resulted from submission of test bars to a central laboratory for certification. It is interesting to note in this connection that the malleable industry over at least the last 20 year period constantly has asked the American Society for Testing Materials for an increase in the standard physical specifications.

Advancements in metallurgy have disclosed that the same process which forms malleable iron will form other valuable products if the method of maunfacture is varied. Products have appeared which are similar to malleable iron, except that they contain up to 0.80 per cent of combined carbon, as against malleable iron, which contains practically none. The utility of these products is great since care in manufacture will develop high tensile strength with reasonable ductility. A typical example of such a material would have a tensile strength of 90,000 pounds per square inch, a yield point of 70,000 pounds per square inch and elongation of 16 per cent in 2 inches. Another type might have a tensile strength of 70,000 pounds per square inch, a yield point of 50,000 pounds per square inch and an elongation of 16 per cent. The field of usefulness for such metals has not yet been explored adequately. The handicap at the present time is the necessity for expensive equipment for the accurate heat treatment required to obtain uniformity.

These metals cannot be properly classed as malleable iron and as yet no standard has been set up by any of the engineering societies covering physical properties, although steps have already been taken not only to find a name which covers the various materials in this group but also to investigate the practicability of tentative specifications covering such products.

Technical Progress

NOTWITHSTANDING the remarkable technical progress which has been made in the production of malleable cast iron, college text books on metallurgy often mention malleable iron in a vague sort of way as illustrative of the reactions of the decomposition of iron carbide. Little, if any, emphasis is laid on the merits of the material obtained through the formation of temper carbon.

The author also has been surprised to find a great number of misconceptions concerning malleable iron prevalent among engineers. Therefore this article has been prepared to present interesting data on the subject to designing engineers, engineering students and others interested.

The article is from a paper presented at a joint meeting of the Western Society of Engineers, the Chicago section of the American Society of Mechanical Engineers and the American Foundrymen's association, held March 18 in Chicago.

Exempts Code Authorities

Under recent ruling of the commissioner of internal revenue, code authorities are entitled to exemption from federal income taxes and from filing returns. They are required to file with the collector of internal revenue in their district, an affidavit on a form required setting forth the character of the organization, the purpose for which it was organized, its activities, etc. This exemption does not extend to members or employes of code authorities.

Melt Metals with Natural Gas

(*Concluded from page* 26)

cent, tin 5 per cent, lead 5 per cent and zinc 5 per cent. Castings show the following minima in physical characteristics: Ultimate strength 27,000 pounds per square inch; yield point 12,000 pounds per square inch; elongation in 2 inches 16 per cent.

No. 2, also more familiarly known by its composition name 88-10-2, that is 88 per cent copper, 10 per cent tin and 2 per cent zinc, is a stronger metal than No. 1 and shows a tensile strength of 30,000 pounds per square inch. It is also a trifle harder as indicated by the elongation, 14 per cent in 2 inches.

A typical mixture for acid resisting castings contains copper 73 per cent, lead 20 per cent and tin 7 per cent.

Preheat the Air

The air supply for the furnace is preheated in a chamber between the lining and the shell before it combines with the gas. The flame enters the furnace tangentially through an opening near the bottom and thus avoids impinging directly on the pot. Metal from the large crucible is poured into smaller crucibles and distributed to the various floors as required. During the melting period the furnace is covered by a lid attached to a pivot post at the back. A short flight of steps and a platform at the back facilitate charging metal in the crucible.

Molds are made by hand on part of the floor area, also on a number of molding machines located close to one of the side walls. Roller conveyors carry the molds from the machines as shown in Fig. 6. After the molds are poured they are shaken out in the space between the conveyor units and the sand is cut back to the vicinity of the molding machines. On the machines served by overhead sand hoppers the sand is transferred from the floor to the hoppers by a sand mixing machine capable of throwing a stream of sand to a height of 12 or 15 feet. Molding machines were supplied by the Tabor Mfg. Co., Philadelphia and the Johnston & Jennings Co., Cleveland. The sand throwing and mixing machine was made by the Universal Sand Equipment Co., Cleveland.

The same grade of sand, No. 1 Albany, is employed in the molds for ferrous and nonferrous castings. Most of the castings are molded in green sand. Practically the only exceptions are heavy castings of monel metal. The molds for these castings are painted with a silica wash and skin dried. Cores for these castings also are coated with silica wash to resist the high temperature. Facing sand is made up of 12 parts molding sand, 6 parts sharp sand, 2 parts fire clay, ½ part proprietary cereal binder.

Small cores for the general run of castings are made of sharp sand bonded with oil. The usual mixture for a wide range of miscellaneous cores contains 33 1/3 parts old core sand, 33 1/3 parts sharp sand, 33 1/3 parts new molding sand bonded with a cereal binder in the proportion of 1 part binder to 60 parts sand. The cores are dried in gas fired shelf type ovens located in a core making room partitioned off from the remainder of the foundry department.

Typical pattern layouts are shown in Figs. 3, 4 and 5. In many instances as in Fig. 3 where the castings are symmetrical a group of half patterns on a single plate may be used for making both cope and drag of the mold. In the group of valve plugs to the left a runner extends from the center sprue to a gate between the two core prints on each pattern. In the group of valve body patterns on the right a short gate in the center connects the sprue with each pattern.

Two half patterns and two half coreboxes are required for the small centrifugal pump body shown in Fig. 5. With a single gate this casting occasionally showed a slightly defective area on the top side where the metal is thin. The defect disappeared with the introduction of the two branch gate shown in the illustration.

Patterns Are Split

Pattern equipment for making the mold and cores for a four-way valve body and plug is shown in Fig. 4. The pattern for the body is split through the center and the mold is made in a two-part flask. Since the fourth flange cannot be removed from the mold as part of the main pattern, it is attached loosely as a ring to a seat turned on the pattern. In practice the half pattern supporting this ring is placed on a board and the drag is rammed in the usual manner up to the top of this flange. Suitable rods are rammed in the sand under the flange to support the projecting body after the entire pattern has been removed. The flange pattern is removed and a flat dry sand core is lowered into place over the cavity. The remainder of the drag then is rammed full of sand and rolled over. The remainder of the process in forming the mold is carried out in the usual manner.

Where the plug shown in the right foreground Fig. 4 is subjected to severe service the stem is a steel shaft. The shaft is placed in the print with one end projecting into the mold cavity where it is gripped by the molten metal and anchored in place.

Boys Trained By English Company

A shortage of skilled craftsmen threatens the foundry industry today in England as well as America. Recognizing the impending danger, the Stanton Works, England, adopted an apprentice training plan, the operation of which was outlined by E. J. Fox, managing director, at a meeting of the Lancashire branch of the Institute of British Foundrymen, held at Grand Hotel, Manchester, Feb. 2. Fifteen months have passed since the inception of the project, and those in charge are thoroughly satisfied with the progress shown.

The boys are engaged by the company and placed in various departments, explained Mr. Fox, on the basis of tests, designed to aid in the determination of whether or not the applicants possess the desired general intelligence, foresight, and vocational aptitude. A small molding shop called a "nursery", run by the boys under the direction of a skilled man, serves as a class room to teach general molding principles. By filling vacancies in other shops from the "nursery," these craftsmen of the future are gaining a varied experience.

Boys with a secondary education, being considered good material for supervisors and foremen, receive an insight into the chemical and design phases of foundry operation by working in the pattern shop and laboratory. Further, the company refunds fees and traveling expenses in connection with evening technical classes where a sufficiently regular attendance warrants the expenditure. Attendance is optional, but the apprentice supervisors, in individual conferences, stress the advantage of technical training.

The difficulty which the Stanton works is experiencing is the scarcity of applicants, a large proportion of which indicate a preference for work as fitters, electricians, or patternmakers rather than craftsmen in the foundry proper.

However, the Stanton works have made a decided step forward in securing real craftsmen of good intellect to take their places in the foundry industry, the mechanization of which, Mr. Fox believes is causing a proportional increase of highly skilled labor and a decrease in unskilled and semiskilled classes.

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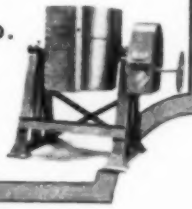

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LIQUID BINDER

Gray Cast Iron—*Chapter I (Concluded)*

(*Continued from page* 30)

Sample No.	Estimated Lengths in Millimeters 1	2	3	4	5	6
Largest	0.020	0.030	0.100	0.200	0.250	0.700
Average	0.004	0.010	0.025	0.100	0.125	0.150
Smallest	0.001	0.002	0.005	0.010	0.015	0.040

It is apparent that there is a large range in flake sizes, the extremes ranging from 0.001 millimeter for the smallest to 0.700 millimeter for the largest. The averages varied from 0.004 to 0.150 millimeter.

Direct comparison of correctly prepared micrographs of representative areas affords valuable information, particularly if accompanied by analyses showing the actual amount of graphite present.

Speculation regarding the actual shapes of the individual flakes has aroused much discussion. Many investigators describe the graphite as flat flakes or plates. There is not much question but that the flakes are built up of many tiny flat plates loosely grouped together as can be seen from particles of graphite from iron treated (or dissolved) in acid. The author believes that the flakes often are more pencil like than flat. Quite often micrographs of coarse grained irons show small rounded particles, suggesting the possibility of pencil like flakes cut across the longest axis. By focusing on the edge of a large graphite flake, then upon the bottom, it is readily established that the flake has appreciable depth at directions at right angles to the general longitudinal axis.

F. Roll—*Die Giesserei*, 1928, No. 51, pages 1270-1274—reconstructed the actual volumetric shape of certain graphite structures in cast iron. In his method, a photograph is taken of a graphite flake on the polished surface of the sample. Then the sample is ground off to a definite depth, and another photograph is taken of the same flake. That procedure is continued until the flake has disappeared. A volumetric model is constructed from the photographs and from a knowledge of the depth of each grinding. Another method is to use plates. By taking a series of these at different depths of cut and later spacing them consecutively at distances apart corresponding to the depth of cuts, a good idea of the shape of the flake can be obtained. Roll's studies apparently indicate that the flake *cross* sections are more or less rounded, hence the flakes are pencil like.

The late Prof. Howe, noting the almost complete lack of matrix continuity in some gray irons, advanced the theory that the graphite flakes have a ferritic matrix which establishes some further degree of continuity within the matrix. In his book, *Metallography of Steel and Cast Iron*, he presents a reproduction of a photograph of a graphite flake with an indistinct bright formation, conceivably a ferritic network, apparent in it. The author later published a similar illustration in THE FOUNDRY, May 15, 1923, page 406, Fig. 9.

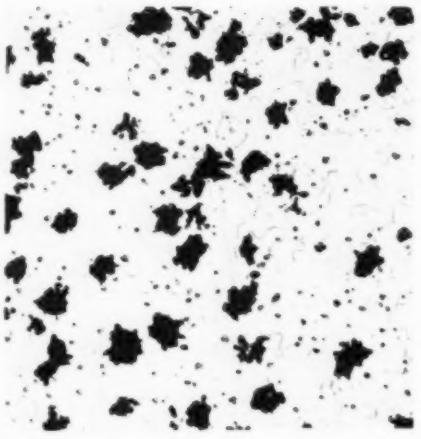

Fig. 42—Temper carbon in malleable iron

A. L. Norbury and L. W. Bolton — *Foundry Trade Journal*, Oct. 10, 1929, page 265—"are of the opinion that the network structures shown are not real, but are caused by an optical effect due to focusing on a cavity containing the fractured remnants of a graphite flake. . . . In some places the ferritic matrix underneath may be seen showing through the remnants of the graphite flake". However, these workers admit the presence of from 30 to 37 per cent of iron (ferrite) in isolated graphite flakes.

More recently the author prepared samples showing distinct ferritic network presumably within, although possibly immediately below the graphite flakes. These formations were brought out by certain sodium picrate etchings.

The graphite within the flakes evidently exists in a form of small plates. Often the flakes contain small sulphide globules and other inclusions.

Certain characteristic groupings of graphite flakes have been recognized and commented upon by many investigators. It was thought that the appearance of these formations probably suggest significant structural relationships — as indeed they do.

In a paper by the author "Some Graphite Formations in Gray Iron"—THE FOUNDRY, Oct. 1, 1927, pages 758-762—the more characteristic flake formations or groupings are listed as follows:

1—The broad large flake formation with a background of extremely fine and evenly distributed small flakes, Fig. 35. This structure is characteristic in hypereutectic irons, as will be explained later.

2—The rosette or whorl formation, Fig. 36, *A* and *B*.

3—The dendritic striation, Fig. 39, *A* and *B*.

4—A grouped formation consisting of clearly defined dendritic bunches or groups made up of extremely fine and numerous small flakes. Fig. 40, *A* and *B*.

5—Characteristic rounded temper carbon bunches, Fig. 42. These are typical of malleable iron.

6—To those just discussed we may add the extremely fine graphite structure (uniformly distributed throughout the metal) often referred to as graphite pseudo-eutectic or as graphite eutectic, the proper term to use depending on the real and as yet not certainly defined nature of this formation. This structure is the same in general nature as the background structure referred to in Fig. 35, or the grouped formation referred to in Fig. 40.

7—The seventh and last characteristic graphite formation is known as kish. Kish is free graphite which has separated from molten iron before solidification. Kish is found loose frequently in cavities in certain pig irons. It is black and shiny, resembling the familiar loose graphite sold for lubricating purposes. Kish also frequently is found around the casting houses at blast furnaces. It separates from the molten metal and often is carried away by convection currents.

A classification of shapes of graphite in cast iron is given by F. Roll—*Die Giesserei*—1928, No. 51, pages 1270-1274—as follows:

1—Isolated flakes.

2—Flakes connected with each other, (a) the coarse flake, (b) the graphite net, (c) the rosette like globular graphite and (d) the whorl graphite.

3—Eutectic graphite, (a) the graphite net, and (b) the globular graphite.

4—Temper graphite.

This classification is no different in its essential features from the classification devised by the author, and later discussion will refer to the earlier classification.

Other terms have been used to describe graphite formations. The Japanese workers Okochi and Sato refer to the rosette or whorl formation No. 3 as kekule or *chrysanthemum like* formation. There is a variation of the whorl formation sometimes referred to as *star* formation, Fig. 41.

As a rule no iron is composed wholly of one formation. Various formations may be found in the same sample. The classification is qualitative. However, these formations possess real significance, from both structural and mechanical viewpoints.

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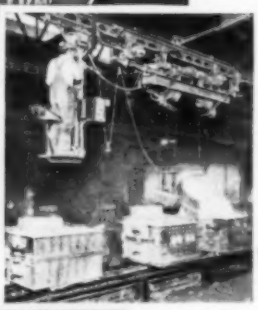

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The thought "Make you the world a bit more beautiful and better because you have been in it" guided Edward Bok, Curtis publisher, through life. Alfred Berchem, looking back on the 50 years of the American Art Bronze Foundry, readily might find application of that philosophy to the life of this father, Jules, who devoted his life to casting bronze statuary, portrait busts, bas-reliefs, and tablets, from the age of 9 until he died in 1930 at 73. A sketch of his life and an article on American Art Bronze Foundry, which he established, appeared in Jan. 15 and February 1, 1930, issues of THE FOUNDRY.

The Alma Mater group at the University of Illinois which was cast by the American Art Bronze Foundry

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Works of art molded in Chicago grace the land from coast to coast Outstanding among them is the Alma Mater Group, located on the University of Illinois campus, Urbana, Ill., and sculptored by Lorado Taft. In this group, shown in the accompanying illustration, labor shakes the hand of learning and Alma Mater stands with outstretched hands welcoming returning alumni. Works of Hibbard, Crunelle, and Holm, pupils of Taft at American Art Institute, Chicago, have been made permanent by American Art Bronze Foundry.

Coincident with the anniversary, the company has published a booklet setting forth advantages of the French sand method and urging users to become "bronze wise." It advises investigation of samples and alloy formulas.

Officers Elected By Detroit Association

Vaughan Reid, City Pattern Works, Detroit, was elected president of the Detroit Foundrymen's association at the regular meeting held April 18 at the Harmonie club, Detroit. Leslie G. Korte, Riley Stoker Corp., was elected vice president; Harry J. Deutsch, Aluminum Co. of America, secretary; and Frank X. Mushynski, American Car & Foundry Co., treasurer.

Jesse D. Stoddard, Detroit Testing laboratory, was appointed representative to the American Foundrymen's association. Members of the executive board are as follows: R. Blair Crawford, Atlas Foundry Co.; Harry W. Dietert, U. S. Radiator Corp.; Ira F. Cheney, Griffin Wheel Corp.; Hugh Martin, Detroit Gray Iron Co. and Harry Rayner, Dodge Brothers Co.

Harry W. Dietert, U. S. Radiator Corp. presented an interesting and instructive talk on sand control, particularly in respect to contraction and expansion of the sand. He presented charts illustrating the cause and effect of expansion and contraction. Much of the material presented by Mr. Dietert represents further research work completed during the past year.

Frederick G. Sefing, Michigan State College of Agriculture & Applied Science, East Lansing, Mich., announced the program for the foundry short course being held under the joint auspices of the college, the A. F. A. and the Detroit Foundrymen's association.

Book Review

Quality Steels (Die Edelstaehle), by Franze Rapatz, fabrikoid, 286 pages, 5¼ x 8 inches, published by Julius Springer, Berlin, Germany, and supplied by THE FOUNDRY, Cleveland.

This book, written in German, is the second edition of the author's work, which first appeared in 1924. As may be expected, the progress in steel making over a decade has necessitated complete rewriting of the text matter. The term quality steels as designated by the author includes not only the alloy steels but also plain carbon steels whose production requires more attention and higher cost than ordinarily is the case, and which are made for specific purposes. In general the term applies to those steels made by quality steel works and sold under trade names.

The subject matter is divided into 13 chapters including the introduction. The second chapter is devoted to structure theory and gives information on the various iron-carbon combinations, transformation points, structural constitution with slow and rapid cooling, hardening theories, and precipitation hardening. Heat treatment in its various phases is discussed in the third chapter while the fourth chapter describes hot shaping. The fifth chapter presents information on cold working and recrystallization, and the sixth gives data on the effect of various alloying elements.

Chapter seven lists various alloy steels according to the alloying elements with data on properties and applications. Strength properties are presented in chapter eight while chapter nine describes customary properties and fields of applications of the steels, and includes such phases as magnetic properties, coefficient of expansion, electrical resistance, rust and acid resisting steels, heat resisting and high speed steels, tool steels, etc. Chapter ten discusses various testing methods, and chapter eleven, production. Chapter twelve describes various defects such as fibrosity, shrink holes, gas holes and porosity, forging cracks, slag inclusions, scabbing, surface decarburization, and cold shortness. The final chapter summarizes the work.

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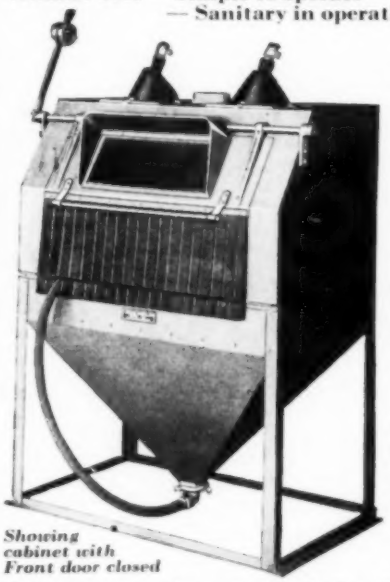

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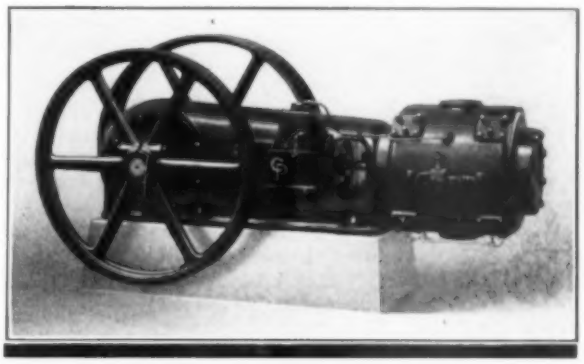

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Good bye to the Isle of Capri!

The Adventures of Bill

BY PAT DWYER

DO YOU know," I said to Bill the other night, "if I was one of these poetical fellows, I should be inspired to burst into song at this season of the year. The winter is over and jolly old spring, with its rolling crest of green has flooded the country. A positive miracle, my dear lad, enacted under our eyes every year and we accept it all without comment. Every once in a while some prominent individual nearly dies, a comparatively insignificant fly speck on the face of the earth. Skillful medical attention snatches him ashore just before he steps on old Charon's ferry boat and the newspapers from one end of the country to the other, beat the drums and shout 'A miracle! A miracle!' Here for five or six months of the year every tree and shrub is dead, and then almost overnight they blossom forth again in all their glory. Crocuses, tulips and daffy-down-dillies spring from the earth like the banners of an advancing army, and yet we accept the transformation as calmly as if we were entitled to it."

"Well," said Bill, "if you want to start an argument over the thing, I'll say we are entitled to it. The phenomenon of the changing seasons is just another manifestation of the well known law of compensation. We have to put up with the winter whether we like it or not. Therefore we are entitled to whatever pleasure we can snaggle out of spring. I see no reason for your getting up on your hind legs to howl like a coyote over something that has been going on without your assistance for a million years. Every newspaper editor in the country could howl until he was black in the face and he could neither hurry nor retard the arrival of spring by the minutest iota or the most microscopic jot or tittle, if there is such a thing as an iota or a jot and tittle."

"Yes, Virginia, there is such a thing as a jot and tittle. It is just a synonym or another name for your reasoning ability. I did not raise any issue over mankind's control of the seasons. I simply stated that the coming of spring is a stupendous miracle worthy of public recognition."

"All right. All right. Let it go. Personally I can think of nothing of less consequence. Unless possibly you care to include the flock of spring poems, pale, sickly weeds that creep through the cracks in the mental garrets and attics of the long haired brethren and sistern. Perhaps that should be spelled cistern. Fortunately one can skip this form of tripe when it appears in print. Most of the songs on the radio fall in the same category. When I am alone I can shut 'em off, but usually other people are present and since the moaning and crooning seems to give them pleasure, I have to endure the agony in silence."

"That may apply to some of the material presented over the radio, but certainly you must except the *Isle of Capri*. One of the most tuneful melodies I ever heard. The words, too, I think are singularly appropriate. Can't you imagine yourself—"

"Well," said Bill, "I'll tell you. I am willing to admit that the melody has a certain appeal. In fact I'll go further and admit that I like to listen to an orchestra playing it. I have heard it sung by one or two people who could sing, but on the other hand, as you might say, I have heard it murdered scores of times by people whose voices are more fitted for doing the rougher and more elemental barnyard imitations, the heart breaking yowls of a forgotten calf and that kind of thing. Without exception they also insist on improving the musical score. The original version is written in one flat and the score ranges from *C* below to *D* on the staff. Off hand you would say that a blind man suffering from laryngitis could cover this limited area without a mistake. Some of the birds I have heard executing—and executing is right—some of the birds I have heard executing this song on the radio, not only suffer from blindness and laryngitis, but apparently also suffer from deafness in one or both ears. In a score that embraces a single octave they can hit more sour half tones than an amateur trombone player in his first attempt at *Turkey in the Straw, With Variations.*

"Just to indicate my strictly impartial attitude to one and all, man

The course of true love seems to have struck a snag

and beast, I am willing to go on record as an admirer of the melody. The words of the song are not so hot. Just a mess of the standard doggerel turned out by the yard in Tin Pan alley and nipped off in suitable lengths to fit any musical score. Any ordinarily intelligent person could achieve a better fit, in the majority of instances, with one hand tied behind his back."

"The trouble with you," I said, "is that you have been rooting around in the foundry so long, you have lost all appreciation of romance. What could be more beautiful and tenderly sentimental than: ' 'Twas on the Isle of Capri that I found her, beneath the shade of an old walnut tree. Oh, I can still see the flowers blooming round her, where we met on the Isle of Capri.' "

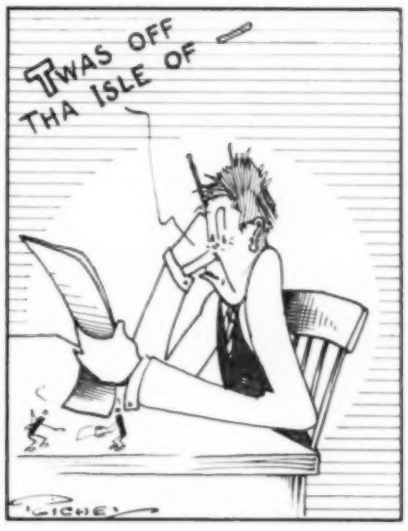
"What's wrong with it? I'll tell you what's wrong with it. The statement is too indefinite. He says he found her beneath the shade of an old walnut tree, but you are left to guess whether he is referring to a girl, a dog or a cow. Any of these may be found under the shade of a tree, especially on a hot day and association of ideas presents the cow as the more logical choice of the three. Use of the word *found* would seem to indicate that the object, person or thing was lost, when as a plain matter of fact, as disclosed later in the song, the lady was a native of the place and therefore was not lost. If any person was lost it was the author, lost in his choice of a word.

"In the next verse we are told she was sweet as a rose at the dawning. A rather unfortunate simile, since at the dawning all the little roses are covered with dew. To follow the simile to a logical conclusion we may assume that the lady was all wet. Through slang association, this term no longer is considered complimentary.

"Supreme egotism crops up in: 'But somehow, fate hadn't meant her for me.' Why should he expect that fate had meant her for him? He drifts ashore one day in an old suit of hand-me-downs and a sou'wester, happens to spy an elegant lady taking her ease in the shade of an old walnut tree, and because she did not immediately fly to his arms, he sets up a wail that somehow fate had not meant her for him. If you ask my opinion he was lucky she did not set the family dog on him. He sailed with the tide in the morning, but left his heart on the Isle of Capri. If he had hung around a little longer until the lady's husband appeared on the scene he might have sailed with the tide in the morning with a stone around his neck, or he might have remained permanently under a few feet of earth on the Isle of Capri. Some husbands are right peevish in the presence of philanderers.

"Le's see. What comes next? 'Summer time was nearly over.' Why the unnecessary *time?* Surely the word summer describes the season with a sufficient degree of accuracy."

"Not necessarily," I said. "For all you know to the contrary the inspired writer may have meant daylight saving time. If you know anything about poetry you know he could not work in that term and make the line come out even. If he had written 'Daylight-saving time was nearly over' the person attempting to sing the words would have to



Our hero dashes off a hot one

hop three or four hurdles to keep pace with the piano. My own opinion is that the writer was right and your objection is out of order, out of season, ultra vires, nux vomica and in a word out of the window you must go."

"Sez you! This bird was not thinking of daylight saving time. How do I know? He was a sailor and sea time is reckoned by the sun. When the sun reaches the highest point in the daily arc the ship clock marks 12 o'clock, eight bells, and all the king's horses and all the king's men, on the Isle of Capri or elsewhere can't change it. Also, why should any person wish to introduce daylight saving time on the Isle of Capri, a quiet little island in the bay of Naples where nothing ever happened since Garibaldi retired to rest after taking Italy apart and turning it inside out. I bet you if the old warrior was living today, egotistical young rovers would not have the opportunity of prowling around the island, prying under old walnut trees and smirking at beautiful ladies with and without plain golden rings on their fingers. What's that? Garibaldi's home was in Caprera? My error. I'm a stranger here myself.

"That brings us down to the declaration, the high point, the climax of what I believe you referred to some time back as the beautifully tender and sentimental episode. At one time or another I have read descriptions of how ardent young suitors go through the performance of what is known as *declaring their intentions.* They are gentle, persuasive, eloquent and persistent in conformity with a convention that the object of their affection is a pearl of great price, moving in a highly rarefied atmosphere and only descending to a consideration of mundane affairs, say on Sunday and Wednesday evenings after 8 of the clock.

"Basing an opinion entirely on the evidence submitted, the hero in this instance dispensed with all the preliminary hemming and hawing including making a leg and pulling the forelock. The words he used are so tender and sentimental, so vivid in their intensity that one has no trouble in visualizing the scene. The fair young maiden reclining in a hammock in the shade of the old walnut tree. Up the graveled path comes Barnacle Bill the sailor, preceded by an aroma of rum and stale cigaret smoke.

" 'Lady,' he croaks out of one side of his mouth, 'I'm a rover. Can you spare me a sweet word of love?'

"If you can see any more tender sentiment in that, than in the old familiar 'Hey, buddy, I'm broke. Can you spare me a dime?' then all I can say is you should get yourself a job as a baseball umpire or as a teacher in one of these places where reading is done by running the finger tips over the letters.

"As I said before, any person can write that kind of tripe. Lend me a pencil and a piece of paper and I bet in less than half an hour I can turn you out a poem with all the merits—and demerits— of the composition you are raving about."

****Astericks indicate lapse of 27 minutes and 14 seconds.

"Listen," said Bill, "from where you're at, and you'll hear the tale of an OLD YELLOW CAT:

'Twas off the Isle of Capri that I
drowned her
I said that I would and, by GEE
I laughed out aloud as around her
The waves bore her far out to sea.

She was up with the dawn—On the
level,
When she slept was a mystery to me.
She was dirty and smelled like the
devil
Or the nest of an old G.O.A.T.

Summer time was nearly over
This kind of thing had to stop.
I said, "I'll make you a rover,
And over the rail you go, PLOP!"

The old cat was no good as a mouser,
She certainly had me up a tree.
Till I hoisted her overboard, YOUSER!
A few miles from the Isle of Capri.

Canadians Make Convention Plans

(*Concluded from page* 21)

chairmen, O. H. Shenstone, Massey-Harris Co., Ltd., Toronto and C. L. Ley, Dominion Wheel & Foundries Ltd., Toronto.

Personnel of the executive committee is as follows: Chairman, L. L. Anthes, Anthes Foundry, Ltd., Toronto; vice chairmen, George C. Crawford, Standard Sanitary Mfg. Co. Ltd. and Dominion Radiator Co., Ltd., Toronto and A. G. Storie, Fittings Ltd., Oshawa; convener of committees, John T. Hepburn, John T. Hepburn Ltd., Toronto; C. E. MacDonald, International Nickel Co., Toronto; D. B. McCoy, Steel Co. of Canada, Ltd., Hamilton; Col. Jas Ingles, Toronto Hardware Mfg. Co., Ltd., Toronto; E. Holt Gurney, Gurney Foundry Co., Ltd., Toronto; and Melville P. White, Canadian General Electric Co., Ltd., Toronto.

On General Committee

The following memberships in the general committee have been announced: Chairman, L. L. Anthes; George C. Crawford; A. G. Storie; John T. Hepburn; O. W. Ellis, Ontario Research Foundation, Toronto; Jos. Sully, Sully Brass Foundry Ltd., Toronto; C. G. Sherwin, Grinell Co. of Canada, Ltd., Toronto; B. G. Newton, MacLean Publications Co. Ltd., Toronto; G. F. Allan, Hoyt Metal Co. of Canada, Ltd., Toronto; H. E. Hall, Jas. Morrison Brass Mfg. Co. Ltd., Toronto; Fred Armstrong, Port Hope Sanitary Mfg. Co., Ltd., Toronto; C. H. O. Pook, Canadian Westinghouse Co. Ltd., Hamilton; Frank A. Sherman, Dominion Foundries & Steel, Ltd., Hamilton; Stewart Clare Bros. & Co. Ltd., Preston; A. R. Goldie, Babcock-Wilcox & Goldie-McCulloch, Ltd., Galt; S. C. Evans, Taylor-Forbes Ltd., Guelph; R. J. Hopper, Pratt & Letchworth Co. Ltd., Brantford, Ont.; James B. Bertram, John Bertram & Sons, Ltd., Dundas, Ont.; Wm. G. Beatty, Beatty Bros. Ltd., Fergus, Ont.; Hugh Lamont, General Steelwares Ltd., London, Ont.; John Stevens Jr., Empire Brass Mfg. Co., Ltd., London; F. Smith, E. Long, Ltd., Orillia, Ont.; W. H. Clatsworthy, McKinnon Industries, Ltd., St. Catharines; George B. Frost, Smiths Falls Malleable Castings, Ltd., Smiths Falls; H. W. Burgess, Wallaceburg Brass & Iron Mfg. Co. Ltd., Wallaceburg; Oswald Lawson, Windsor-Walkerville Technical school; H. C. McLean, Western Foundry Ltd., Wingham; W. B. Campbell, Mueller Ltd., Sarnia; H. A. McEwen, Rahn Metals Ltd., North Bay, Ont.; F. M. Morton, International Harvester Co. Ltd., Hamilton; Ellis H. Jones, Yale & Towne Mfg. Co., St. Catharines; William T. Muir, Canadian Foundry Supplies & Equipment, Ltd., Toronto; R. B. Morley, Industrial Accident Prevention associations, Toronto; and C. C. MacDonald, Frederic B. Stevens of Canada, Ltd., Toronto. In addition, all chairmen and vice chairmen of the committees previously mentioned are members of the general committee.

While the Canadian group is making arrangements for the social and entertainment feature of convention week, Robert E. Kennedy, technical secretary of the A. F. A., has been preparing the program of the technical meetings. As now outlined, Monday will be devoted to meetings of various technical committees. Technical sessions will start with a shop operating course at 9:30 on Tuesday morning and will continue until noon on Friday. Since it is believed that many of those attending the convention will be interested in visiting various points of interest in Toronto, the program for afternoon meetings will be light to permit this opportunity, and one evening session is being planned so that the technical phases of the meetings may cover the usual broad scope. The annual banquet is being arranged for Thursday night. The convention will close on Friday noon to permit the foundrymen to attend the opening of the Canadian National exposition, where special features will be provided for visiting foundrymen.

Selecting Ladle Refractory Materials

To eliminate the possibility of metal contamination from ladle linings in the gray iron foundry, care should be taken in selecting lining materials. The following specifications have been suggested as a guide in selecting such materials:

Refractory materials should be acid base, excepting where highly alkaline slag is run.

Analysis, expansion and contraction limits of brick should be held uniform. When installing the lining, particular attention should be paid to laying of joints, using material of the same analysis for that work. Bottoms should be laid with expansion joints to prevent spalling and bottom raising.

Plastic material should be from 50 to 70 mesh, uniform in grain size, with low limit for impurities, expansion and contraction. Such mixtures should be well mulled and allowed to temper for a time before using.

Materials should have a fusion point above 3100 degrees Fahr. and softening point above 2900 degrees Fahr.

Lining material should be rapped or rammed as thin as possible, and a wash should not be applied after the lining is complete.

The lining should be dried with a wood fire or in an oven with a temperature not more than 350 degrees Fahr. until all free moisture has been driven off. Then an oil or gas torch may be applied and the temperature gradually brought up to the maximum of the burner, so that when the ladle is placed in service, there will be little difference between the lining temperature and that of the iron which it receives.

Prior to putting ladles into daily service, they should be heated to a high temperature to eliminate spalling or cracking as the result of violent change from plant temperature to molten iron temperature. That practice will reduce slag, adhesions, and the building up of side walls.

Book Review

The New Dilemma, by Roger W. Babson, cloth, 224 pages, published by Fleming H. Revell Co., New York, and supplied by THE FOUNDRY for $2.00 plus 15 cents postage and in Europe by the Penton Publishing Co. Ltd., London.

A strong indictment of most of the alphabetical agencies and many of the actions of the present administration is tempered slightly by praise for several agencies such as the Reconstruction Finance Corp. and the Civilian Conservation Corps. Following only the advice of radicals is likened to rowing a boat with only one oar, and has resulted in uncertainty as expressed in the New Dilemma, rather than in recovery from the depression. Fallacies of the New Deal include the following five acts: Repudiating contracts; wasting public funds; substituting horse racing and other forms of gambling for ticker tape; giving the nation rum and whisky; and constantly increasing the burden of public debt.

The author sees the need of character as the greatest factor in our economic well being. He points out that lack of righteousness among business leaders threatened the collapse of capitalism and now lack of righteousness among political leaders threatens the governmental system.

Talks on Patterns

William Neilson, Boston, addressed the regular meeting of the New England Foundrymen's association held at the Engineers club, Boston, April 10, on "Pattern Problems of the Jobbing Shop".

ADVERTISING PAGES REMOVED

When a Good Salesman Says No

(*Concluded from page* 33)

to balance or overcome the immediate advantage the buyer seeks to obtain. Secondly, it lowers the prestige both of the salesman and of his firm in the purchasing agent's eyes. It reduces them to mere order-hunters.

One foundry salesman for an important foundry was told by a buyer that he could have an order for castings with pleasure if he would promise to find a situation for the buyer's son in the foundry's office. The salesman replied somewhat to this effect:

"I'm sorry, Mr. Brown, but I can't do business in that way. If your son likes to apply for a job at our place, he's as likely to get one as anybody, if he's suitable and there's a vacancy. But I can't guarantee either condition, and even if I took your order on these terms, my firm wouldn't execute it if they knew how it had been obtained. If I haven't convinced you by now that our castings will save you money just where you want it saved, I shan't do it by taking an order that hasn't been gained by fair methods. I won't sell my stuff to anyone who doesn't believe in it."

Would Refuse to Take Order

I can imagine some readers arguing that any salesman who took this line would be fired by his firm in times of depressed business, when every order of consequence is bitterly fought for. Well, it may be so. But I feel convinced in my bones that there are still many firms and salesmen of repute who would take up this commonsense attitude, and refuse to take an order on terms they felt to be ultimately damaging.

Perhaps one cause of the depression was excess of the "orders at any price" attitude among salesmen, and not only foundry salesmen. There is still too much inclination to find gilt-edged, royal-road methods of selling castings; too little concentration on the real art of salesmanship, which lies in making the buyer want the goods because they are good. You can get orders if you beg hard enough, but you can't get life-accounts that way. What foundry salesmen should remember is that regular accounts are more important than orders, and regular accounts can only be won by salesmanship. Buyers come and go, friendship wanes, influence vanishes, even reciprocal accounts swell or dwindle according to the state of trade. All these are fluctuating things, and orders won on their strength alone can never be safe, certain, and continuous.

The one stable thing is the value of the castings to the buyer. As long as the quality remains the same, there will be little danger of losing the account. The danger of obtaining orders by offering immediate advantages unconnected with the goods is that they are only immediate advantages. They are ephemeral, like the accounts they sometimes succeed in opening. Often, too, the offer of some inducement to order goods sets up in the buyer's mind, whether mistakenly or otherwise, an impression that the goods must be inferior, else it would be unnecessary to make irrelevant offers of this kind.

Every good foundry salesman knows that sometimes he is securing orders best by refusing them. This may seem paradoxical, but it is nevertheless true. The very act of refusing an order raises the prestige of a firm in a buyer's eyes. It shows clearly that he has to do with a firm which obeys fixed principles and refuses to adopt hole-and-corner methods. It shows likewise that the salesman himself is truly the representative of his firm, with authority to refuse orders it would be undesirable to accept, and with enough moral and financial support from the foundry to warrant his refusing them without inward regrets and hankerings or equivocations.

Some of the reasons for refusing orders may conveniently be enumerated here:

1. Because the purchasing agent seeks some inducement to order not connected with the goods themselves.

2. Because the purchaser wishes to beat down the price to a level at which it would be impossible to supply the castings and make a fair profit or meet costs on the transaction.

3. Because it is known that delivery cannot be effected in the time required.

4. Because the castings will not successfully meet the customer's needs.

5. Because the purchaser will not accept certain stipulations necessary for the satisfactory carrying out of a contract.

6. Because the order is too small to be handled profitably.

It has to be pointed out that these six reasons for refusing orders are not to be taken as so many fixed rules. But, in general, it will be found that more is gained than lost by knowing how and when to refuse orders on these grounds. In nothing is a refusal more advisable than when a matter of delivery is concerned.

Some time ago a large firm had a big order to place for locomotive castings. Two firms competed for it, but one of the conditions was that a first delivery of a certain tonnage should be made in 6 weeks, followed by regular weekly consignments of equal weight. The first firm's representative said at once that such a delivery could not be guaranteed, but promised that his firm would do their best to deliver as near to the required date as possible. He refused the order eventually because it would not be given except in exchange for a pledge that the required quantities should be ready on the dates specified. The other competitor unscrupulously accepted the order on the buyer's terms, but at the end of three months the first delivery was still only partly made. It was, of course, impossible to cancel and reorder, and one might have thought that the unscrupulous steel founder had the whip-hand, and profited by his dishonesty. But what happened? The buyer sent for the salesman who had had the courage and commonsense to refuse the order he could not execute promptly, and signed a five years' contract for the supply of all future requirements. Incidentally, the first founder is no longer in existence today; the other is. This, incidentally, is no fable, but a true story.

One other warning needs to be given. It is not enough to know *when* to refuse orders. One must also know *how* to refuse them. Curtness, rudeness, impatience, contumely, are all to be avoided. The foundry salesman always should word his refusal in such a way as to leave the door open for his return when the buyer becomes more reasonable. In particular, he never should leave without making the reasons for his refusal clearly understandable. There must be no autocratic rejections. The aim should be to make the buyer feel that he loses by the refusal.

Book Review

Directory of the Refractories Industries; paper, 56 pages, 8½ x 11 inches; published by American Refractories institute, Pittsburgh; supplied by THE FOUNDRY, Cleveland, for 50 cents postpaid; in Europe by Penton Publishing Co. Ltd., Caxton House, Westminster, London.

This 1935 directory, the ninth edition, presents in convenient form information relative to brands, products and plants of members of the refractories industry in the United States. It should prove a valuable reference compilation to users of refractories, especially purchasing agents, metallurgists and engineers in industries which depend upon high temperatures in their plant production and operation. Listings are divided into three sections as follows: 1.—Alphabetical directory of brands; 2.—alphabetical directory of members of the refractories industry; and 3.—geographic location of refractories manufacturers' plants.

Obituary

JOHN R. DUNHAM, superintendent, Chevrolet Motor Co., gray iron foundry at Saginaw, Mich., died at Berea, O., April 19. He was taken ill while visiting relatives in that city. Mr. Dunham became superintendent of the Chevrolet plant 5 years ago, and prior to that held the same position with the Dunham Co., Berea.

♦ ♦ ♦

Raymond D. Howle, secretary and treasurer, Columbus Malleable Iron Co., Columbus, O., died April 16.

♦ ♦ ♦

William McLean, 67, president of the Dunbar Corp., Dunbar, Pa., died at Germantown, Pa., recently.

♦ ♦ ♦

Charles A. Stockstrom, 83, chairman of the board of the American Stove Co., St. Louis, and president of the company for 25 years, died in Mount Clemens, Mich., April 25.

♦ ♦ ♦

Frederick G. Jones, 62, for 15 years superintendent of the Scott & Williams Foundry, West Concord, Mass., died March 28. Mr. Jones also was associated with the M. D. Jones Iron Works, West Concord.

♦ ♦ ♦

Everett C. Metcalf, 73, since 1896 president of the Westmoreland Malleable Iron Co., Westmoreland, N. Y., and for a number of years prior to that vice president, died in Westmoreland recently. The company was established in 1893.

♦ ♦ ♦

A. Saunders Morris, 73, retired foundryman, died April 12 in a Philadelphia hospital. Prior to his retirement 4 years ago, Mr. Morris was vice president of the Cresson-Morris Co. and previously was associated with the A. S. & P. H. Morris Foundry.

♦ ♦ ♦

V. T. Hammer, 67, vice president and assistant treasurer of the Malleable Iron Fittings Co., Branford, Conn., died March 17. Mr. Hammer entered the plant shortly after graduating from school and held many responsible positions with the organization. His father, Thorbald Hammer, was a founder of the company.

♦ ♦ ♦

Charles H. Read, 88, prominent in the early steel industry in Pittsburgh, died at Los Angeles, April 12. In 1879 he engaged in the steel casting business under the name of Read & Thaw, Pittsburgh. Later this concern was moved to Johnstown, Pa., and Mr. Read became assistant general manager of the then Cambria Iron Co. He resigned from this position in 1885, returned to Pittsburgh and assisted in organizing the Duquesne Steel Co., Duquesne, Pa., and as general manager and director of that company, supervised the erection of its bessemer plant and blooming mill. Later this company was sold to the Allegheny Bessemer Steel Co., which eventually was merged with the Carnegie interests. He was active in the steel business until 1915, when he retired.

Repairs Mill Casting by Welding

A broken housing of a 160 inch plate mill recently was repaired at a mid-western steel mill by thermit welding. The casting, minus all appurtenances, weighed 164,000 pounds, stood 21 feet 8½ inches high, and was 14 feet 9 inches wide at the base and 10 feet wide at the top.

The original fracture, which caused the housing to be removed from service, occurred in the lower portion and ran from an inside corner diagonally downward through a Tee-shaped section, one leg of which was 38 x 12 inches and the other leg 30 x 26 inches. In preparing this fracture for welding, another crack was discovered above the first, running through a section shaped roughly like an I-beam with members 26 x 8 inches, 26½ x 8 inches, and 30 x 15 inches.

Four tons of thermit were required to make the two welds, shown in the accompanying illustration. The entire job, from the waxing of the first fracture to the pouring of the second weld, was completed in exactly one week.

Two welds were necessary in repairing this large steel casting

Accident Frequency Rate Declines

While the foundry industry reduced the frequency of its accident rate 2 per cent during 1934, the severity of such accidents increased 50 per cent, according to a report by the National Safety council, Chicago. The frequency rate is based on the number of disabling injuries per 1,000,000 hours worked, the severity rate, on the number of days lost per 1000 hours worked.

In contrast to the decline in frequency for the foundry industry, most of the other major industries reported an increase in number of accidents. The rise in the severity rate of the foundry group is attributed to the employment of new men, since those industries showing the largest gain in number of hours worked also had the greatest increases in severity of accidents.

Book Review

Arsenical and Argentiferous Copper, by J. L. Gregg, cloth, 190 pages, published by the Chemical Catalog Co., New York, and supplied by THE FOUNDRY, Cleveland for $4.00 and in Europe by the Penton Publishing Co. Ltd., London.

This is one of the American Chemical society's series of scientific and technologic monographs, and represents an attempt on the part of that society to found an American chemical literature without primary regard to commercial consideration. The work was prepared by the author and the technical staff of the Battelle Memorial institute under the sponsorship of the Calumet & Hecla Consolidated Copper Co.

The text treats first a general history of the development of copper mining from ancient times to the present, and then discusses the properties and uses of copper. This is followed by information on the geology of arsenical and argentiferous copper, composition, electrical and thermal properties, mechanical properties, and the corrosion of arsenical copper and brass. The final chapter deals with uses of arsenical and argentiferous copper.

The appendix describes data on copper production from 1920 to 1931, compares the prices of metals and alloys in cents per pound, A.S.T.M. specifications for various copper products, etc. An extensive bibliography also is included.

National Copper Paint Co., Chicago, has been incorporated to manufacture and sell a newly developed paint containing 98.3 per cent copper. H. M. Rice, manager of the Nichols Copper Co., Chicago, a unit of the Phelps-Dodge Corp., is president of the company.

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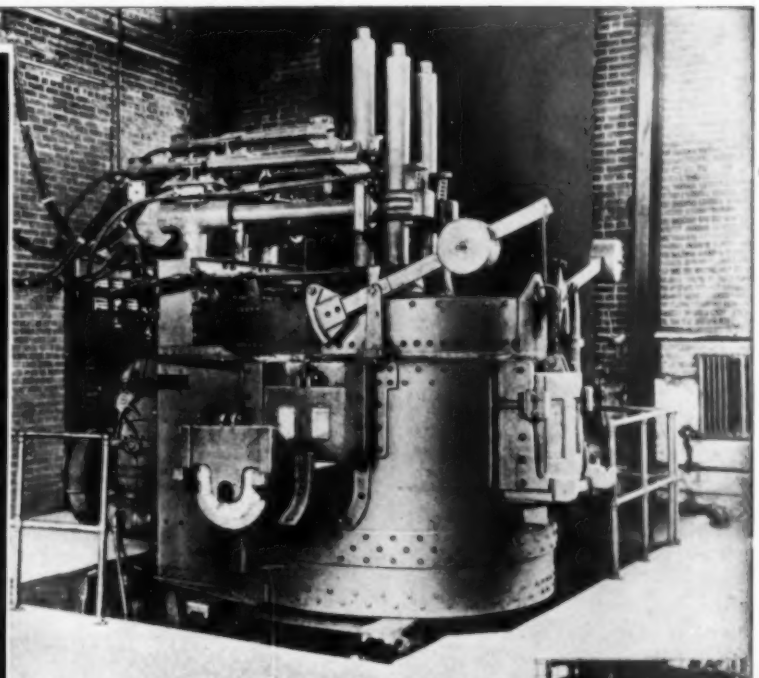

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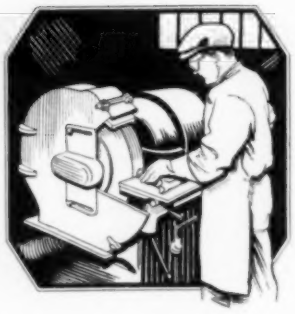
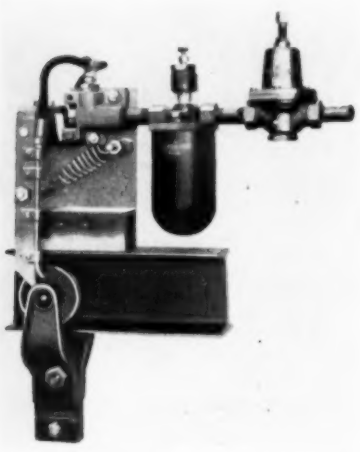


For Foundries

Lubricates Trolley Bearings Automatically

J. N. Fauver Co., Detroit, has introduced a pneumatic trolley lubricator as shown in the accompanying illustration. With that unit, plant air pressure is reduced by standard reducing valves to operating pressure. The air then passes through an air line lubricator which introduces lubricating oil of the proper viscosity into the air stream, a drop at a time. Thus a fog of oil leaves the air line lubricator and is applied under air pressure to the trolley bearings.



Jets of fogged air are directed to the bearing by the lubricator

As each trolley passes under the lubricator, it trips a pair of triggers which automatically releases jets of fogged oil, forcing the lubricant directly into the bearings. Air pressure, oil volume, and direction of jet are readily adjustable. An oil storage capacity of 1½ pints is provided.

Needle Valve

A new type of needle valve which is interchangeable on all blowpipes now in service, recently has been introduced by the Linde Air Products Co., 30 East Forty-second street, New York. The valve consists of a seat between the blowpipe body and the needle valve which is made of a hardened and highly polished stainless steel ball, held in a cage at the end of the valve stem. It is claimed that this type valve closes readily with but the slightest effort of two fingers, and opens with equal readiness.

Operating Pressure Of Oil Burner Is Low

Philadelphia Drying Machinery Co., Philadelphia, recently has developed a new low-pressure oil burner designed to give efficient combustion over a wide range of capacities with various grades of fuel, to give more uniform heat distribution throughout the furnace, to provide close atmospheric control, and give freedom from dribbling and safety from explosion.

In operation, oil enters through a small supply line at the back, passes through a central oil tube to a distributor inside the burner housing, where it is directed into an oil chamber surrounding the primary air orifice. Air enters through a butterfly valve in the center lower portion of the burner housing, whence part of it enters the distributor head and passes through the primary air orifice and then through the venturi. This creates a partial vacuum in the oil chamber so that oil is withdrawn in a thin film around the air. The film is broken into a fine mist and is mixed intimately with the primary air as it passes through the venturi.

In this form or combination of oil and air, complete combustion is assured.

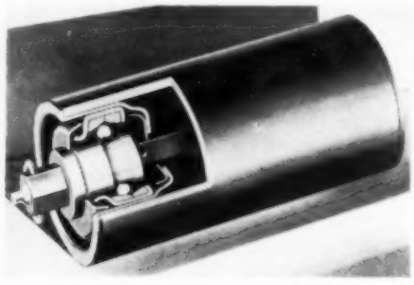
The secondary stream of air flows between the burner body and the outside of the mixer. It is given a whirling action and is then discharged through the orifice near the nose of the burner. Here it acts on the primary mixture to provide further atomization and mixing. Variable capacity is obtained by turning a handwheel at the back of the burner, which causes the venturi to move longitudinally and thus to vary the secondary air opening at the nose of the burner.

The burners are made in nine sizes ranging from ¾-inch to 6-inches for pressures ranging from 8 ounces to 32 ounces of air and for capacities of ⅛-gallon per hour and upward.

Roller Conveyor Bearings Are Protected

Logan Co., Louisville, Ky., has introduced a roller conveyor having a hexagonal shaft to prevent rotation of the shaft in the frame and rotation of the bearing race on the shaft. A simple retainer ring in each end of the shaft prevents lateral movements.

Bearings are protected from dust with a steel labyrinth seal, where such protection is necessary. The entire bearing assembly is set back slightly from the end of the roll in a protected position, the design of the labyrinth tending to make it self cleaning as the roll revolves. Pressure lubricated bearings are recommended where excessive quantities of dirt or corrosion influences are present, or where the service is severe.



Bearings are protected from dust with a steel labyrinth seal

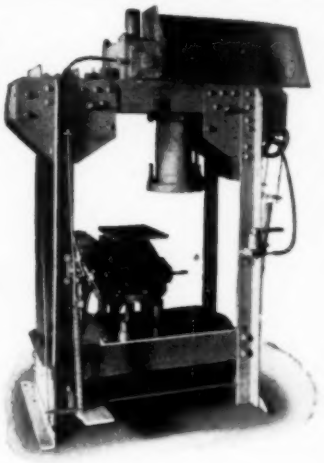
A cutaway view of the bearings, shows the interior construction.

Starting Switch

A starting switch designed for use when hand-operated control at the motor is required and intended for direct mounting on the built-in terminal box of standard fractional-horsepower motors, recently has been introduced by the General Electric Co., Schenectady, N. Y.

The switch is of the single-pole type, rated 6 amperes at 125 volts or 3 amperes at 250 volts. According to the manufacturer it is suitable for use where overload protection is not required and where the locked rotor current of the motor need not be broken.

Auto Malleables
Plumbing Goods
Stove Burners
Manifolds
Pipe Fittings
Vacuum Cleaners
Condulets
Carburetors
Specialties



Cores for the above castings are being made universally on our machines, resulting in greatly increased production and better cores.

We have a machine for your job.

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Wm. Demmler & Bros.
Kewanee, Illinois

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When you come to Toronto on business or pleasure—or on business and pleasure combined—you'll naturally want to stay at the Royal York,—the last word in metropolitan comfort and convenience, the head centre of Toronto's business and social life. Here you will receive the attention, courtesy and service for which Canadian Pacific hotels are world-famous.

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Save Men, Money and Machinery by Better Dust Removal

Leading industries use and endorse Kirk & Blum Dust and Fume Removal Systems because they safeguard the health of workmen—at a lower operating cost.

K & B Engineering Service—backed by years of experience in designing and installing dust and fume removal systems, is yours without obligation. Before you repair or replace your present blower equipment, why not take advantage of this service. Write

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2808 Spring Grove Ave., Cincinnati, Ohio

Detroit Factory and Office: 4718 Burlingame
Chicago Office: 3843 N. Central Park Ave.
Pittsburgh Representative:
Bushnell Machy. Co., 1501 Grant Bldg.
Louisville Representative:
Liberty Blow Pipe Co., Inc., 325 Roland St.

Meter Designed To Measure Any Fluid

A universal meter designed to measure any fluid under any industrial condition recently has been introduced by the Foxboro Co., Foxboro, Mass. The new measuring instrument has a flow rangeability of 10 to 1. Charts have uniform graduations which enable the operator to read the records easily. Where necessary or desirable, temperature and pressure records may be recorded on the same chart with the flow.

A new mechanical integrator has been built especially for the meter and shows total flow on an easily read

Total flow may be read directly on the counter

counter. New metering accuracies are made possible, it is claimed, by a pressure compensator produced by the company. This is supplied on the meter wherever widely varying static pressures make it otherwise impossible to get accurate measurement. Check valves protect the meter from overrange flows or incorrect manifold valve manipulation.

Mercury Vapor Lamp for Bay Lighting

General Electric Vapor Lamp Co., Hoboken, N. J., has introduced a high intensity mercury vapor lamp particularly suitable for high bay lighting. It is claimed that the light is a new approach to an industrial white light which is restful to the eye, which enables quick visual response even to details unknown under other commercial lighting. The lamp produces 14,000 lumens at a consumption of 400 watts, or approximately 35 lumens per watt. It has an over-all length of 13 inches and is designed for operation on 110 volt and 220 volt, 60 cycle circuits. It has an average life of 1500 hours.

Lift Truck Steers Through a Caster Wheel

Yale & Towne Mfg. Co., Philadelphia, has developed a lift truck designed for handling loads from 300 to 1000 pounds. The truck will handle a 36 x 42 inch skid platform in a 4-foot aisle. Steering is accomplished through a caster wheel shown in the accompanying illustration, to permit use in a small operating space.

To elevate the load, the operator grasps the handle, depresses the treadle and leans back. His weight by this leverage action lifts the load. The handle remains in a position to pull the load away. To lower the load, the operator pulls down the handle, depresses the treadle and lets the weight of his body act as a counterweight. Descent of the load always is under control. When locked in the elevated position, the platform cannot be released accidently.

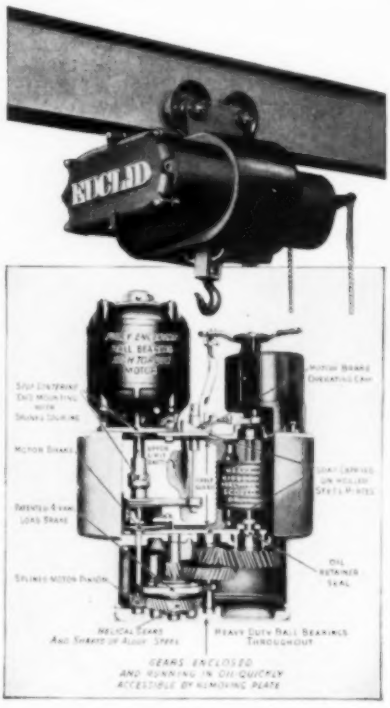
The company also has developed a light weight platform as shown in the accompanying illustration. These platforms are built in sizes ranging from 24 to 36 inches in width and 24 to 60 inches in length. Underclearances are 6½, 7½ and 9½-inches.

The truck will handle a 36 x 42-inch skid platform in a 4-foot aisle

A feature of the platform is the light weight

Electric Hoist Utilizes Spiral Gear

Euclid-Armington Corp., Euclid, O., has introduced an electric hoist in which a helical or spiral gear drive has been used. It is claimed that the spiral gears provide a drive that is more efficient, quieter, stronger and smoother in operation. All shafts rotate on heavy duty ball bearings, and high torque ball bearing motors are used. All gears are totally enclosed in dust proof covering, and run in oil. All bearings are splash lubricated



View showing construction of the operating mechanism

and the shafts are equipped with special oil retainers.

A load brake contains four pawls, two diametrically opposite being always engaged. A powerful cam control disk brake stops the motor instantly and avoids drifting of the load. A view of the unit, showing the construction, is shown in the accompanying illustration.

Screen Type Filter

Linde Air Products Co., 30 East Forty-second street, New York, has introduced a new screen filter for its oxygen regulators. Instead of using a flat screen across the inlet, a double, cone-shaped, bronze screen has been developed. A cone of coarse metal screen fits inside one of finer mesh, and both are held in the inlet nipple by a newly developed locking screw.

PANGBORN-NORBIDE*

The Blast Nozzle that Assures More Dollar Value

THE PANGBORN-NORBIDE* "Long Wear" Blast Cleaning Nozzle is made from the hardest material ever produced by Man for commercial use. It is the only blast nozzle on the market that can be used hour after hour for an average of approximately ten months service—without replacement.

CONSIDER THIS GUARANTEE

All Pangborn-Norbide* "Long Wear" Blast Nozzles are unconditionally guaranteed to produce at least 1500 hours service with steel abrasives; 750 hours with sand.

Write Today for our new Pocket Data Card—showing all Nozzle Sizes, Prices, and necessary fittings.

*Trade mark of Norton Company for Boron Carbide.

PANGBORN

The World's Largest Manufacturers of Blast Cleaning and Dust Collecting Equipment

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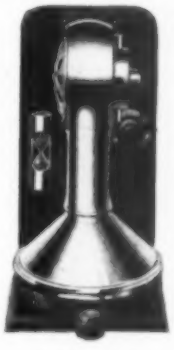
Make Castings That Create Sales Not Castings That Just Pass

Mold Hardness

Improve your casting quality by improving your sand with sand control.

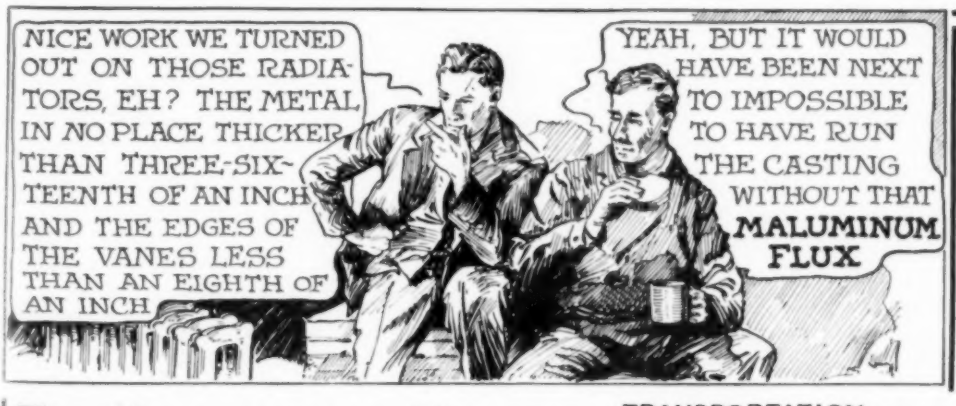
Mold Hardness and Moisture Control bring quick results. Locate Moisture Teller in foundry at mixing station. Test mold hardness of molds as they are produced. The effective control that pays the first day.

MOLD HARDNESS and MOISTURE CONTROL Equipment cost only $83.00



Moisture Teller

676 W. Grand Blvd. **Harry W. Dietert Co.** Detroit, Mich.


NICE WORK WE TURNED OUT ON THOSE RADIATORS, EH? THE METAL IN NO PLACE THICKER THAN THREE-SIXTEENTH OF AN INCH AND THE EDGES OF THE VANES LESS THAN AN EIGHTH OF AN INCH
YEAH, BUT IT WOULD HAVE BEEN NEXT TO IMPOSSIBLE TO HAVE RUN THE CASTING WITHOUT THAT MALUMINUM FLUX

FLUXES FOR ALUMINUM BRONZE BRASS

LADLE FLUXES FOR **CAST IRON**

SPECIAL FLUXES FOR SPECIAL ALLOYS

THE MALUMINUM COMPANY TRANSPORTATION BUILDING **INDIANAPOLIS, IND.**

Portable Grinder Has Universal Motor

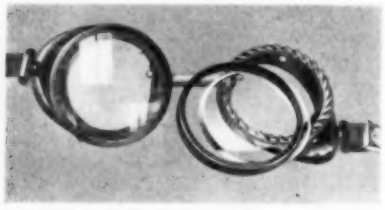
Chicago Wheel & Mfg. Co., Chicago, has introduced a portable electric grinder of the universal type which has a built-in air filter for handling all air entering the motor.

The new tool weighs 4 pounds, turns 17,000 revolutions per minute and has sufficient power to pull a wheel 2-inches in diameter. The heavy cast aluminum motor housing extends out over the motor shaft and air filter and is encased with an insulating cushion grip.

The filter is of the viscous type and can be removed easily for cleaning and re-oiling.

Goggle Provided With Special Ventilation

American Optical Co., Southbridge, Mass., has introduced a new goggle which is ventilated effectively but gives protection from splashes of dangerous liquids and the impact of flying particles. Eyecups are molded to fit snugly to the contour of the face and so to prevent liquid from entering around the goggle. Air circulates through slots in the lens rings, through the radial slots in the eyecups and through the perforated side shields. A solid baffle plate in back of the side shield is flared out on the edge nearest the lens, permitting air circulation, but isolating the eyes from splashes.



Eyecups are molded to fit snugly to contour of the face

Adjustable rubber-covered ball chain bridge, together with the adjustable one-piece headband provide for exact and comfortable fitting to the individual worker. A view of the goggle is shown in the accompanying illustration.

Mounting of Dies Facilitated by Design

Newton - New Haven Co., New Haven, Conn., recently has introduced a high-pressure die casting unit known as a four bar machine. This heavy duty plunger type machine, shown in the accompanying illustration, is designed for pressure casting of zinc and zinc base alloys. Claims for this machine include added capacity, quick die mounting, increased production with ease of operation and added safety.

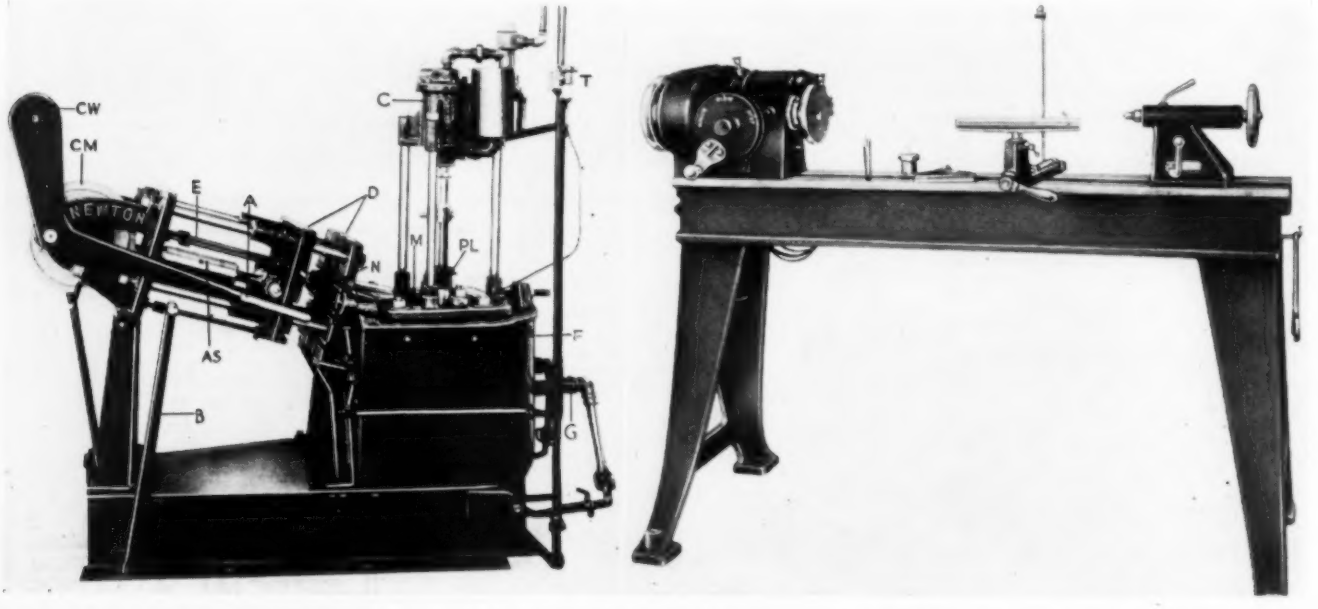
One of the four sliding bars is removable to facilitate quick mounting of dies with automatic core pulls. Roller bearings have been included in the cam and both cam shaft bearings. A fifth bumper bar has been added at the bottom of the sliding bolster to facilitate ejection of overhanging dies. A safety device has been incorporated to prevent the operator from making a shot or pump until after the die is locked. The machine is equipped with automatic metal temperature control.

In production, the operator moves levers *A* and *B*, shown in the accompanying illustration, during each casting operation. All other operations are automatic. The metal is melted in pot *M* by atmospheric gas burners *G* under thermostatic control *T*. Self-aligning dies are clamped to die bolsters *D* with *T* slots. Dies are closed and opened by lever *A* which turns cam *CM*. The casting operation is made by moving lever *B* to the left to operate the piston of air cylinder *C*. This piston drives plunger *PL* down and forces the metal into the die through nozzle *N*. Castings are ejected automatically in the opening of the die when the ejector plate contacts adjustable bumper bars *E*.

Wood Working Lathe Is Motor Driven

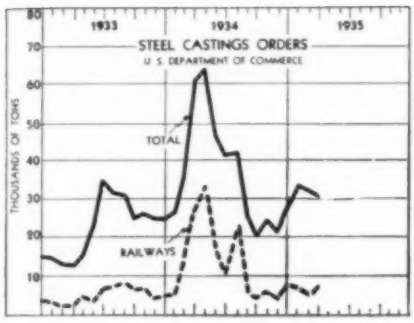
Oliver Machinery Co., Grand Rapids, Mich., recently has introduced a wood turning lathe which has a capacity of 12 inches diameter swing over the bed; 10¼-inches diameter over the hand tool rest, and up to 24-inches long on a 48-inch bed. A longer length bed can be supplied if desired. Headstock is adjustable to any desired speed from 800 to 2400 revolutions per minute. The headstock unit consists of a head block with ball bearing spindle driven by a ball bearing motor operating through a V belt on adjustable cone sheaves. Speed changes are accomplished by shifting a lever at the side of the head block. The motor is mounted directly in back of the head block and is controlled by a switch mounted inside the headstock. The unit is compact, rigid, accurate and may be set up at any convenient location.

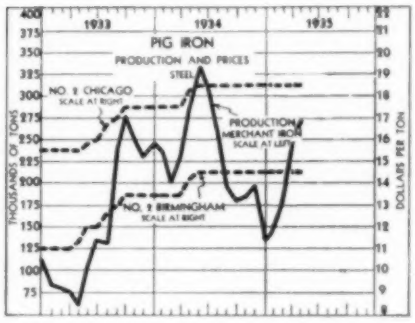
A view of the lathe is shown in the accompanying illustration.

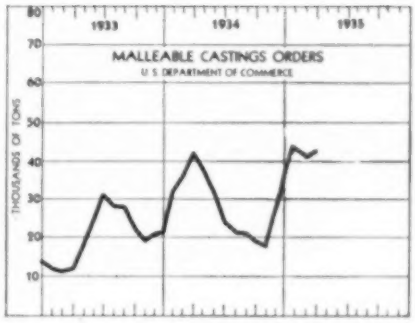


Left—One of the four sliding bars is removable to facilitate quick mounting. Right—The lathe has a capacity of 12-inches diameter swing over the bed

ADVERTISING PAGES REMOVED







Foundry Activities

Reflect Industrial Trends

CHEVROLET MOTOR CO.'S gray iron foundry at Saginaw, Mich., set an all-time record for single day pouring on April 19, with a total of 2306 tons. The previous high record was 2152 tons, set a year ago. The record was made with 12 cupolas in operation. On four successive days, ending with the record performance, an average of 2103 tons a day was poured. The total for the five-day week being 10,279 tons. It is reported that General Motors is planning to reopen the Pontiac foundry.

* * *

Union Stove Co., Chattanooga, Tenn., has been organized by R. L. St. John.

* * *

Ford Motor Co. of Canada, Windsor, Ont., recently opened its new electric foundry.

* * *

Fulton Iron Works, St. Louis, was awarded a loan of $225,000 by the Reconstruction Finance Corp. in March.

* * *

Alabama Pipe Co., Anniston, Ala., has opened its Union Foundry plant and has employed 200 men on a three-day a week schedule.

* * *

Steel Castings Corp., 301 South Hoyne avenue, Chicago, has been incorporated to operate a foundry by Jerome Jehlen, Jerome E. Jehlen, and Mary Jehlen.

* * *

Chemung Foundry Co., Elmira, N. Y., recently poured a 5000 pound brass bushing to be used as a replacement part in a hydraulic lifting machine.

* * *

Collins-Neville Foundry Co., 917 East Thirteenth avenue, North Kansas City, Mo., has been organized by W. L. Neville and Otis E. Collins. Mr. Collins, who is superintendent, formerly was foundry superintendent of the Weber Engine Co., Kansas City.

* * *

Sullivan Stove Foundry Inc., 201 South Broad street, Sullivan, Ind., has been incorporated by Harry I. Smith, Clinton Fisher and Eva Fisher.

* * *

Index of foundry equipment orders for March, according to a report of the Foundry Equipment Manufacturers' association, Cleveland, was 68.0 compared with 74.2 in Feb. and 75.4 in March, 1934. Index of shipments was 82.6 compared with 85.1 in Feb. and 62.6 in March a year ago.

RAW MATERIAL PRICES
May 6, 1935

Iron	
No. 2 foundry, Valley	$18.50
No. 2 Southern, Birmingham	14.50
No. 2 foundry, Chicago	18.50
No. 2 foundry, Buffalo	18.50
Basic, Buffalo	17.50
Basic, Valley	18.00
Malleable, Chicago	18.50
Malleable, Buffalo	19.00
Charcoal iron, furnace	21.00
Coke	
Connellsville beehive premium	$5.10 to $ 5.35
Wise county beehive coke	4.30 to 5.30
Detroit by-product coke	8.50
Scrap	
Heavy melting steel, Valley	$11.00
Heavy melting steel, Pitts	$11.25 to 11.75
Heavy melting steel, Chicago	9.75 to 10.00
Stove plate, Buffalo	9.00 to 9.50
Stove plate, Chicago	6.00 to 6.50
No. 1 cast, New York	7.00 to 7.25
No. 1 cast, mchy., Chicago	9.00 to 9.50
No. 1 cast, Pittsburgh	11.75 to 12.25
No. 1 cast, Philadelphia	11.00 to 12.00
No. 1 cast, Birmingham	8.50 to 9.00
Car wheels, iron, Pittsburgh	12.00 to 12.50
Car wheels, iron, Chicago	10.50 to 11.00
Railroad malleable, Chicago	12.50 to 13.00
Malleable, Buffalo	12.00 to 12.50
Nonferrous Metals	**Cents per pound**
Castings copper, refinery	7.75 to 8.00
Straits tin	50.55
Aluminum, 99 per cent	19.00 to 21.00
Aluminum, No. 12 (Secondary)	16.50 to 17.25
Lead, New York	3.75
Antimony, New York	14.25
Nickel, electro	35.00
Zinc, East St. Louis, Ill.	4.20

John V. Beamer has been named receiver for the Wabash Foundry Co., Wabash, Ind.

* * *

Name of the Clancey Malleable Corp., Waukesha, Wis., has been changed to the General Malleable Corp., Waukesha.

* * *

United States Pipe & Foundry Corp., Burlington, N. J., is contemplating large expenditures for new plants and alterations as soon as conditions warrant, according to N. F. S. Russell, president.

* * *

Wellman Bronze & Aluminum Co., 6017 Superior avenue, N. E., Cleveland, is celebrating the twenty-fifth anniversary of the founding of the company. Fred S. Wellman is president.

* * *

Cooper-Bessemer Corp., Mt. Vernon, O., and Schippers-Podevyn Societe, Hoboken-Antwerp, Belgium, have taken licenses for the manufacture of Meehanite metal from the Meehanite Metal Corp., Pittsburgh.

* * *

Muskegon Brass Foundry Co., Muskegon Heights, Mich., which recently went into receivership, formerly was the Enterprise Brass Works. The name was changed prior to the filing of a petition for temporary appointment of a receiver.

* * *

Valley Steel Castings Co., Bay City, Mich., has leased the former plant of the Ohio Steel Foundry Co. and will renew operations. The new

company is headed by Samuel S. Fair, formerly president of the Bay City Electric Steel Castings Co., and Mendel A. Fair, secretary-treasurer.

* * *

Benton Harbor Malleable Industries, Benton Harbor, Mich., has started a program of expansion to increase productive activity. J. N. Klock, president, recently announced that the building housing the die castings division is being enlarged by the addition of 50 square feet. New machinery will be purchased and installed.

* * *

Production of gray iron and steel castings increased during March in the Philadelphia district, according to reports of the Industrial Research department, University of Pennsylvania. Percentage increase of gray iron foundries was the third highest of any March since 1926. Production of malleable iron was slightly less than the preceding month.

* * *

Werra Aluminum Foundry Co., Waukesha, Wis., recently was sold in receivership to a group of Waukesha capitalists represented by Charles E. Nelson. A new corporation has been organized to take over the assets and continue the business. Julius Werra, vice president, is receiver and is the head of the new company, and Conrad Werra, founder of the business and president, will continue with the new organization in a consulting capacity.

* * *

Ownership of the Bay City Electric Steel Castings Co., Bay City, Mich., has been acquired by E. M. Mills, one of the founders, and formerly secretary-treasurer of the company. In taking over full control of the company, Mr. Mills purchased the half interest of Samuel S. Fair, also a founder of the company and formerly president. Under the new organization, Mr. Mills becomes president, Wesley Ceeley, Simons Iron & Steel Co., Lansing, vice president, and L. M. Mills, secretary.

* * *

Foundries of the Eastern Malleable Iron Co., located at Bridgeport, New Britain, Conn., and Troy, N. Y., are being closed and the work transferred to the home plant of the corporation at Naugatuck, Conn., and the plant at Wilmington, Del., according to a recent announcement of Louis A. Dibble, president. The Bridgeport and Troy plants will be closed permanently and the New Britain plant will be held in reserve. Transfer of equipment from Bridgeport and Troy to the Naugatuck and Wilmington, Del., plants is under way.

New Trade Publications

OVENS—Gehnrich Corp., Long Island City, N. Y., has published a booklet on its line of foundry ovens for core baking, mold drying, pasting, preheating, aging, normalizing, annealing and japanning. In addition to a discussion of the features of the various ovens, numerous installation photographs are reproduced to show various designs of core and mold ovens.

HOISTS—Curtis Pneumatic Machinery Co., St. Louis, Mo., has published a folder describing and illustrating a number of uses for its line of air power cranes and hoists.

SILICA STONE—Cleveland Quarries Co., Builders Exchange building, Cleveland, has published a bulletin on its silica stone for acid tanks, steel pickling tanks and acid wash trays.

MALLETS—Lignum Vitae Woodturning Co., 96 Boyd avenue, Jersey City, N. J., has published a bulletin on its line of mallets and mauls made of lignum-vitae or hickory.

FLOODLIGHTS—General Electric Co., Schenectaday, N. Y. has published a bulletin on its line of junior type portable floodlights developed for a wide variety of applications.

GAS ENGINES — Worthington Pump & Machinery Corp., Harrison, N. J., has prepared a catalog on its gas engines. Special emphasis is placed upon the features of design and construction.

PROGRESS—Allis-Chalmers Mfg. Co., Milwaukee, recently issued a well-illustrated booklet entitled "Eighty-Eight Years of Progress," which was given out in connection with an open-house program at the West Allis works. The booklet discusses and illustrates the various products of the company.

INSTRUMENTS — Brown Instrument Co., Wayne and Roberts avenues, Philadelphia, has issued a folder describing the use of its line of instruments for measuring temperatures, per cent of CO_2 flows, pressures, liquid levels, etc. The bulletin is well-illustrated with reproductions of installation photographs.

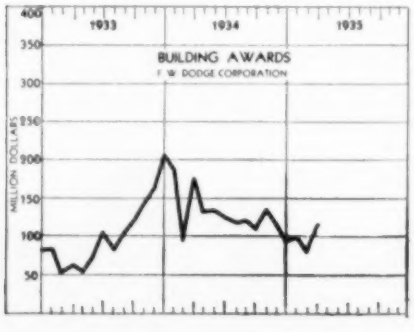
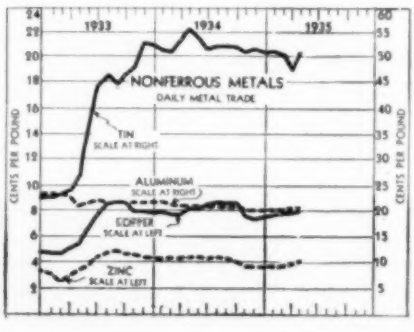
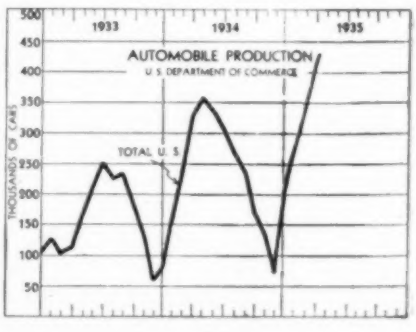
CHAINS—C. O. Bartlett & Snow Co., Cleveland, has issued a bulletin on its line of chains, sprockets, buckets. Standard types of detachable, pintle, ley bushed, combination, drag, roller, transfer, steel bushed and drop forged chain and chain attachments are illustrated, and the dimensions, weights, working loads and prices are given for each size.

PAINT—New Jersey Zinc Co., 160 Front street, New York, has published a booklet on metallic zinc powder in industrial paint. It is pointed out that the utility of zinc dust paint generally is for primers on metal, because of the good rust inhibiting properties and continued flexibility on iron and exceptional adherence to galvanized iron and zinc surfaces.

FLUX—Pittsburgh Metals Purifying Corp., Pittsburgh, has published a booklet devoted to a discussion of its flux for cupola and ladle additions. Information refers to the action of the flux upon the iron, sulphur reduction, amount of the flux to be used, and slagging the cupola. Information also is presented on fluxes for brass and other nonferrous metals, brass cleaners, solders, and coatings.

BRONZE CASTINGS—An exceptionally attractive 64-page catalog on its Taurus bronze castings, recently has been published by the David Brown & Sons Ltd., Huddersfield, England. The booklet is designed as a practical treatise on composition, properties, manufacture and application of bronze castings for engineering purposes. Information is given on approximate chemical composition, average physical properties and a general description of the metal casting for a number of different bronze mixtures.

In accordance with the Trade Practice Provisions of the Code for Periodical Publishing and Printing Industry the following constitutes "Publisher's Statement of Circulation."

This is to certify that the average circulation per issue of THE FOUNDRY for the six months' period July 1st to and including December 31st, 1934, was as follows: Copies sold, 4708. Copies distributed free, 1332. Total 6040. Signed —J. D. Pease, for (Publisher).

Subscribed to and sworn before me on this 22nd day of March, 1935. H. L. Richey, Notary Public. My commission expires May 7, 1936.